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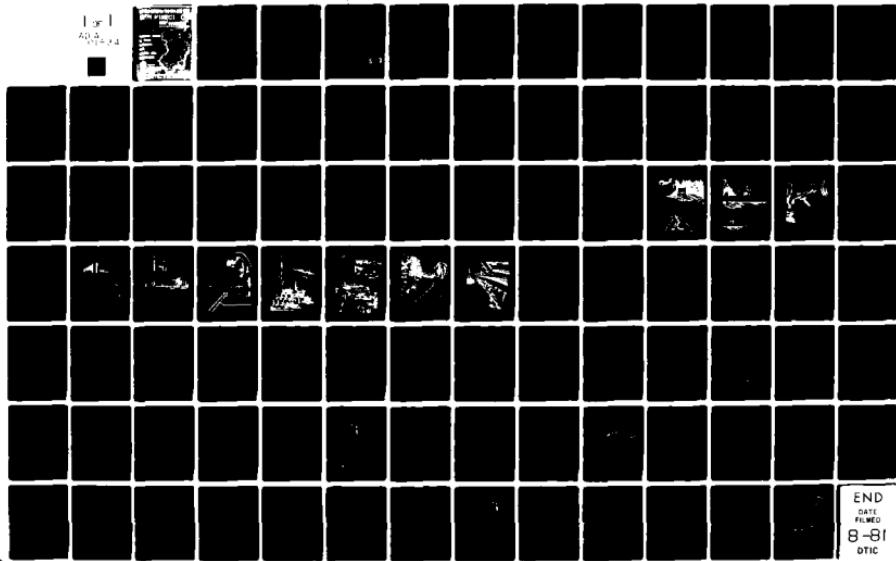
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ABSTRACT (Continue on reverse side if necessary and identify by block number) The purpose of this report is to summarize alternative water and related land management plans developed goals of the Buffalo Metropolitan Area. Four studies comprise the Corps Buffalo Metropolitan Area Study. Since the Erie-Niagara Counties Regional Planning Board has developed a comprehensive area-wide waste treatment management plan under Section 208 of Public Law 92-500. The major emphasis of the study is to develop methods of reducing the amount of phosphorus, determined to be the limiting nutrient, from nonpoint sources.		

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The Erie-Niagara Counties Regional Planning Board has completed their report on areawide waste treatment consisting of 19 volumes. The report is being reviewed by the U.S. Environmental Conservation who are expected to complete their certification review in 1979 for the Governor's acceptance.

SUMMARY REPORT  
OF  
WATER RESOURCES AND RELATED LAND MANAGEMENT  
IN  
THE BUFFALO METROPOLITAN AREA, NY

FINAL REPORT

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U. S. Army, Buffalo District, Corps of Engineers  
1776 Niagara Street, Buffalo, NY  
December 1980

SUMMARY REPORT OF  
WATER RESOURCES AND RELATED LAND MANAGEMENT  
IN  
THE BUFFALO METROPOLITAN AREA, NY

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## SYLLABUS

This report summarizes four studies that comprise the Corps Buffalo Metropolitan Area Study. Three of the studies address flood management in the Cayuga, Cazenovia, and Tonawanda Creek Watersheds. The fourth study identifies a practical development plan for improving recreation access and related water and land management in the Buffalo Metropolitan Area particularly along the Niagara Riverfront. The study also addressed region-wide programs to manage wastewater, floating drift, and streambank stabilization. Other matters related to water supply, water quality, environmental quality and fish and wildlife, were also investigated and appraised in the study. This summary report contains the conclusions and recommendations resulting from the four studies and presents plans, efforts, and brief description of prior and ongoing studies, reports, and projects.

To date, none of the flood management projects recommended in the three interim reports of the Buffalo Metropolitan Area Study have been authorized except the Cayuga Creek project that is authorized to be completed and constructed under Section 205 authority. The Corps work recommended in the interim report for improving recreation access is being implemented under existing authority to operate and maintain the Black Rock Channel and Tonawanda Harbor, NY, project.

Each of the flood management projects, recommended in the interim reports, are economically justified and have benefits in excess of costs for construction and maintenance. The project plan for Cazenovia Creek consists of the construction of a concrete ice retention structure with gated conduits to pass ice free flows and a log ice retaining boom to promote formation of an upstream ice cover and obstruct ice flows during ice breakup. Flood damages in the lower six miles of Cazenovia Creek caused by overbank flooding would be significantly reduced following construction of the ice retention structure and log boom. On October 1974 price levels, the project plan for Cazenovia Creek has an estimated total first cost of \$1,137,000, an average annual cost of \$78,400 that includes \$11,400 for maintenance, and average annual benefits of \$204,300 that results in a benefit/cost ratio of 2.61. The project plan for Cayuga Creek consists of the construction of concrete flood walls with flap gates, earth levees, and erosion protection on the creek banks, to reduce flood damage in the lower reaches caused by overbank flooding. On April 1979 price levels, the project plan for Cayuga Creek has an estimated total first cost of \$962,000, an average annual cost of \$72,900, and average annual benefits of \$85,400 that results in a benefit/cost ratio of 1.2. The project plan for Tonawanda Creek consists of constructing two shallow detention reservoirs (normally dry) arranged in series and requires the construction of two earth embankments each with gated outlet works and emergency spillway. Training dikes are also required to form and contain the lower reservoir. On June 1980 price levels, the project plan has an estimated total first cost of \$22,680,000, an average annual cost of \$2,043,000 that includes \$275,000 for operation, maintenance and repair, and average annual benefits of \$2,617,500 that results in a benefit/cost ratio of 1.28.

The full development plan for improvement of recreation access and related water and land management has an estimated total first cost of about \$5,100,000 on 1975 price levels; equivalent average annual costs of about \$1,040,000, average annual benefits of approximately \$3,700,000, and a

benefit/cost ratio for full development of 3.5. Corps cost participation in the plan is limited to existing maintenance responsibilities for the Black Rock Channel and Tonawanda Harbor, NY, project.

BUFFALO METROPOLITAN AREA, NY  
SUMMARY REPORT OF WATER RESOURCES  
AND RELATED LAND MANAGEMENT

FOREWORD

1. Purpose and Scope of Report

The purpose of this report is to summarize alternative water and related land management plans developed that are compatible with the comprehensive urban development goals of the Buffalo Metropolitan Area. Four studies comprise the Corps Buffalo Metropolitan Area Study. Three studies are concerned with flood management in the Cayuga, Cazenovia, and Tonawanda Creek Watersheds and the other addresses provisions for improving streambank protection, water-related recreation, fish and wildlife management, and water-related environmental quality management. Since the Erie-Niagara Counties Regional Planning Board has developed a comprehensive areawide waste treatment management plan under Section 208 of Public Law 92-500. None of the reports accomplished by the Corps of Engineers under the Buffalo Metropolitan Area Study authority include consideration of wastewater and related water quality management in the area. However, the Corps is engaged in a wastewater management study of Lake Erie that is scheduled for completion in FY 1982. The major emphasis of the study is to develop methods of reducing the amount of phosphorus, determined to be the limiting nutrient, from nonpoint sources. The Erie-Niagara Counties Regional Planning Board has completed their report on areawide waste treatment consisting of 19 volumes. The report is being reviewed by the U. S. Environmental Protection Agency and the New York State Department of Environmental Conservation who are expected to complete their certification review in 1979 for the Governor's acceptance.

This Summary Report includes: an assessment of water and related land management needs; development of measures that respond to those needs; and, an evaluation of recommended plans.

2. Area of Study

The study area is shown on Plate 1. It includes all of the Erie-Niagara Basin and those watersheds tributary to Lake Ontario eastward from the Niagara River to the Johnson Creek watershed. Portions of Chautauqua, Cattaraugus, Allegany, Wyoming, Genesee and Orleans Counties are included in the study area along with all of Erie and Niagara Counties. The Buffalo SMSA includes all of Erie and Niagara Counties. The major emphasis is on water and related land resource management needs in the intensely urbanized portion of the study area.

3. Authority

Authorization for a Buffalo Metropolitan Area Study derives from a resolution of the House Committee on Public Works sponsored by Congressman Jack F. Kemp and adopted on 14 June 1972 which reads:

"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for

Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Cazenovia Creek, and Cayuga Creek, NY, submitted in House Document No. 326, 77th Congress, and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable at this time, with particular reference to providing improvements in the interest of flood control, wastewater management, water supply, water quality, environmental quality, recreation, and fish and wildlife for the Buffalo River Basin, NY."

The Buffalo Metropolitan Area includes, in addition to the Buffalo River Basin, the Buffalo urban area. Therefore, on 5 March 1973, OCE authorized enlargement of the study area to include the Buffalo urban area (SMSA) and redesignated the study "Buffalo Metropolitan Area, NY 44012."

Section 11 of Public Law 93-251, dated 7 March 1974, authorizes a wastewater management study of the Buffalo River Basin, NY. The Erie-Niagara Counties Regional Planning Board has been granted \$1.8 million by the U. S. Environmental Protection Agency to develop a comprehensive areawide waste treatment management plan under Section 208 of Public Law 92-500. Since this plan will include the Buffalo Metropolitan area, it will satisfy the study resolution requirement pertaining to water quality and wastewater management. Therefore, the Corps of Engineers Buffalo Metropolitan study effort will not address water quality or wastewater management. Section 108 of the Federal Water Pollution Control Act Amendments of 1972 does however authorize the Corps to design and develop a wastewater management program for the rehabilitation and environmental repair of Lake Erie. The Buffalo District has been directed to conduct the study at a total estimated cost of \$5.0 million.

#### 4. Objectives

Based upon an assessment of regional needs and focusing the investigation on the Buffalo Metropolitan Area, the objectives of the study are to develop and evaluate alternative plans comprised of both structural and nonstructural measures:

- a. to protect, as fully as practicable; human health and life, property, and industry;
- b. to provide improved and expanded water-related recreation opportunities;
- c. to conserve and improve fish and wildlife resource;
- d. to preserve, develop, beautify, and restore the quality of the water-related environment; and
- e. to provide streambank stabilization and protection to prevent streambank erosion on specified reaches of streams in the study area.

These specific objectives were pursued in response to desires repeatedly expressed by study area residents for flood damage reduction, improved access

to and development of streambanks, shorelands, and associated parks. Full cognizance was taken of prior and ongoing studies of the Erie-Niagara Basin Regional Water Resources Planning Board and the Erie-Niagara Counties Regional Planning Board and the "Principles and Standards for Planning Water and Related Land Resources" developed by the President's Water Resources Council.

#### 5. Study Participants and Coordination

During the study, coordination was maintained with various Federal, State, and local agencies and governmental entities, including:

U. S. Environmental Protection Agency

U. S. Fish and Wildlife Service

U. S. Heritage Conservation and Recreation Service

U. S. Soil Conservation Service (Erie, Wyoming, and Niagara Counties)

New York State Department of Environmental Conservation

New York State Office of Parks and Recreation

Niagara Frontier State Park and Recreation Commission

Niagara Frontier Transportation Authority

Erie County, Department of Environmental Quality

Erie-Niagara Counties Regional Planning Board

City of Buffalo - Department of Public Works

City of Buffalo - Department of Transportation

City of Buffalo - Department of Planning and Programming

City of Tonawanda - Department of Planning and Programming

Town of Tonawanda - Department of Planning and Programming

Many informal workshops were held to acquaint interested agency personnel and involved public participants with study progress and to give them an opportunity to provide input to the study. All of the agencies and interests listed above were contacted as recently as December 1979 to obtain the status of their projects, plans, and studies.

Flood management plans for Cazenovia and Cayuga Creeks was discussed with New York State Department of Environmental Conservation and affected property

owners to determine costs and cost-sharing arrangements. The flood management plan for Tonawanda Creek was discussed with public officials and the general public who would be affected to delineate project impacts. Since all costs for the Tonawanda Creek would be Federal, a discussion of cost-sharing arrangements was not necessary.

The development plan for improving recreation access was discussed with a staff member of the Niagara Frontier State Park and Recreation Commission and staff of U. S. Heritage Conservation and Recreation Service to determine cost-sharing arrangements for the development of plan elements. An inter-agency meeting was held on 26 September 1975 to present cost-sharing possibilities and to obtain the views of the various levels of Government on implementation of the development plan.

Late stage public meetings were held to present all of the plans to the general public and to solicit their views. Careful consideration was given to their views which are reflected in the recommendations. In addition, several informal meetings and discussions were held with local agencies and private interests. Their views are also reflected in the plan recommendations.

## CHAPTER I - SETTING

### 1. Study Area

The Buffalo Metropolitan Study Area (Plate 1) encompasses an area of approximately 2,500 square miles and contains all of Erie and Niagara Counties, substantial portions of Cattaraugus, Genesee, and Wyoming Counties, and small portions of Orleans, Allegany, and Chautauqua Counties situated about its periphery.

The area is drained by the following major watersheds: Cattaraugus, Cazenovia, Buffalo, Cayuga, Scajquada, Ellicott, Tonawanda, and Johnson Creeks. These watersheds drain into Lake Erie, the Niagara River, and Lake Ontario and are bordered by numerous smaller watersheds.

### 2. Population

The combined population of the study area in 1970 was estimated to be 1,422,200 people on the basis of 1970 Census data for each county in the study area.

The Buffalo SMSA which includes Erie and Niagara Counties had a population of 1,349,211 people in 1970, or 95 percent of the study area population.

Plate 2 shows the distribution of population within the study area and the Buffalo SMSA. The study area consists essentially of a strip of waterfront cities, the largest of which is the city of Buffalo, generally surrounded by concentric rings of urbanized and urbanizing areas. Projections of population growth made by the Regional Planning Board show that while Erie and Niagara Counties will have a total population growth of 25 percent by the year 2000 <sup>1/</sup> the strip of population centers along Lake Erie and the Niagara River, Area A in Plate 2, will almost uniformly show a population decline, the largest being the city of Buffalo with a projected decline of 12 percent by the year 2000. Nearly all the projected population growth is concentrated in the towns surrounding the urban center.

### 3. Economy

The Buffalo Metropolitan Area is a major industrial and transportation center. Major industrial areas are located in the city of Buffalo, principally near the Buffalo Harbor and along Lake Erie, and northward along the

<sup>1/</sup> The Regional Planning Board's projection of 1,682,685 people in the Buffalo SMSA in the year 2000 exceeds the OBERS projection of 1,419,600 people by 18.5 percent. The New York State Office of Planning Services projection in the year 2000 is 1,557,250. The Planning Board's projections were used since they are more localized projections and are those used in development of their regional planning efforts. By Executive Order in 1978, the New York State Department of Commerce assumed the responsibilities of the Office of Planning Services for compiling population data.

Niagara River to Tonawanda. The cities of Buffalo and Tonawanda have major port facilities that are connected by a Federally-maintained navigation channel and lock in the Niagara River. Buffalo is a major rail transportation center, and lies astride the New York State Thruway, an important highway linking midwestern and eastern markets.

Outside the Buffalo urbanized area, the study area is primarily agricultural, consisting of small farms and dairies with several small urban centers of light industry. Fruit growing is significant along Lakes Erie and Ontario and there are small areas of high-value vegetable farming in the lake plains. However, agricultural employment now accounts for a small percentage of the total regional employment and is expected to decline to less than one percent by the year 2020.

Regional projections of total employment show the increase in total jobs of 18 percent, from 605,900 to 714,000 in 1990. However, the percentage of manufacturing jobs, now at 30 percent will decline by 1990 to 27 percent. Increased production requirements in the metals, machinery, chemicals, and durable goods industries of Buffalo are expected to be met in the future by improved technology.

A dramatic increase is expected in nonmanufacturing and service industry employment, reflecting a gradual shift of the economic base from heavy industry and manufacturing to services. Gains are expected to be greatest in the fields of personal and business services, amusement and recreation, and medical and education services. A preliminary study by the State of New York Office of Planning Services suggests that about 25 percent of the projected population increase and an increase of 51,000 jobs within the Buffalo SMSA through 1985 will be attributable to the creation of the new 1,125-acre State University Campus in the town of Amherst. SUNY at Buffalo will then be the largest employer in western New York.

#### 4. Land Use

The study area consists of approximately 60 percent crop and pasture land, 20 percent woodland, and 20 percent urban lands. Except for a few scattered small urban communities, such as Batavia, Attica, Lockport, East Aurora, Arcade, Springville, and Gowanda, nearly all the urban land lies within the city of Buffalo and the towns which surround the city in a circular manner. Concentrations of industrial land are located in the city of Buffalo near the Buffalo Harbor, southward from Buffalo along Lake Erie, and along the Niagara River in Tonawanda.

#### 5. Urban Growth Patterns and Projections

Population projections for the study area indicate a pattern of net long-term growth for the region, and in particular the Buffalo SMSA, but a net out-migration from the central urban area of Buffalo.

Urban and suburban development is moving outward in a radial manner from the city, urbanizing the formerly rural towns surrounding the city and encompassing older small urban localities such as Depew-Lancaster, Williamsville, East Aurora, and Hamburg (Plate 3).

Industrial growth is stretching southeastward from the Buffalo Harbor area, and the town of Lackawanna, into the town of Hamburg, and northeasterly from the town of Tonawanda. Significant industrial growth is taking place in an easterly direction from the Buffalo city line through the town of Cheektowaga to the villages of Depew-Lancaster.

It is projected that by the year 2020, the first ring of towns around the city of Buffalo will be fully urbanized, consisting largely of urban residential and commercial development with heavy industry confined within the corridors mentioned above, and light industry confined to planned development areas. By this time the second ring of towns (Area C on Plate 3), including Pendleton, Clarence, Lancaster, Elma, and Aurora, will be suburbanized and partially developed.

## 6. Environmental Setting

### a. Geology, Topography, and Physiography

The Buffalo Metropolitan Area is defined by the watersheds of Cattaraugus, Cazenovia, Buffalo, Cayuga, Johnson, and Tonawanda Creeks, plus the area bounded by these watersheds and Lakes Erie and Ontario, and the Niagara River. This region is located in both the Erie-Ontario lowlands and the Appalachian uplands provinces of New York.

The topography of the region consists of a series of gently rolling plains interrupted by east-west striking escarpments as shown on Plate 4. The land ranges in elevation above mean sea level from approximately 600 feet in the northern area to 2,000 feet in the Appalachian uplands.

The major geologic formations are shown on Plate 4. In the Buffalo Metropolitan Area, the age of the bedrock follows a Paleozoic sedimentary sequence and ranges from the Lockport Group of the Middle Silurian through the Canadaway Group of the Upper Devonian. The rock formations are interbedded shales, siltstones, sandstones, limestones, and dolomites of varying thickness and sequence. Differential erosion left the more resistant rocks as escarpments, separating the low irregular surfaces of the more erodible rocks. The bedrock in the region has greatly influenced the Pleistocene geology.

During the Pleistocene age, the region was subjected to four major advances of glaciers which deposited glacial till as terminal and ground moraines covering the bedrock. In some areas where lakes were formed, silts and clays were deposited over the glacial till. Subsequent erosion by the streams draining northwestward off the Allegheny Plateau and westward across the lowland plains developed the present topography.

### b. Climate

The climate of the region in general is temperate, humid-continental with the chief characteristic of rapidly changing weather. The prevailing winds are from the southwest over Lake Erie.

The variation in amount of rainfall received across the region reflects physiographic influences. Average annual amounts reach 44 inches in the Appalachian uplands in the southeastern portion of the region while the Erie-Ontario lowlands in the northern portion of the region receive average annual rainfall amounts as low as 32 inches. The average annual precipitation for the region computed from long-term rainfall records at U. S. Weather Bureau gages is 37.4 inches. The rainfall amounts caused by storms does not vary significantly over the region. Flood producing storms are as likely to occur in the Erie-Ontario lowlands as over the Appalachian uplands even though average annual rainfall amounts are 12 inches less in the lowlands.

The average annual snowfall experienced in the southern portion of the area is about twice that in the northern portion. All of the major streams in the region originate in the southern areas where the average snow depth is in excess of 90 inches per year.

The average annual temperature in the region is 46.9 degrees Fahrenheit with monthly temperatures ranging from 69.2 degrees Fahrenheit in July to 24.2 degrees Fahrenheit in January. The freezing period is generally from five to six months long.

#### c. Hydrology and Water Resources

Plate 5 shows the location of USGS gaging stations throughout the study area, and includes a summary of the characteristics of major streams and watersheds of the region.

Stream runoff patterns are significantly affected by the storage of moisture in the snow pack during the winter months. Although monthly precipitation in the form of rain or snow is generally uniform throughout the year, 40 percent of the annual runoff occurs during the spring months of March and April because of the combined effects of rain, frozen ground, and the release of moisture retained in the snow pack. In contrast to high spring runoff, monthly streamflows in the summer and early fall are much lower. Due to evapotranspiration, only a small percentage of the rainfall that occurs during these months appears as runoff in streams.

#### d. Classification of Streams

The New York State Department of Environmental Conservation (DEC) has a stream classification system which was developed to protect the highest and best use of the State's water resources. The DEC stream classification system includes the following categories:

- Class AA Water Supply
- Class A Water Supply
- Class B Bathing
- Class C Fishing
- Class D Secondary Contact Recreation

The Niagara River has a Class A - Special classification because it is an international boundary water.

The classification of streams in the study area is shown on Plate 6. Very few streams in the region are classified as Class A streams. These are principally located in the southern portion of Erie County where population density and land use along the streams is light. Niagara County has only two Class A streams and both of these are beyond the projected 1990 area of urbanization.

As with Class A streams, there are also few Clas. B streams in the region, and these are mainly in Erie County. Sections of Cazenovia, Buffalo, Scajaquada, and Ellicott Creeks within the 1990 projected urbanized area are classified as Class B streams. Only three streams in Niagara County are Class B streams. The encroachment of urbanization is the greatest threat to present quality of the water of these streams.

Class C streams, which can be used for fishing, but not as a source of drinking water or for swimming are more numerous than are Class A or B streams. Class C streams are scattered throughout the region, however, almost all of the streams in Niagara County and in central and western Erie County are Class D or Class C streams. It is interesting to note that some of the larger streams begin as Class B or C streams and eventually become Class D streams when they flow through urban areas.

#### e. Biological Resources

Fauna. The distribution of the wildlife resources is related to the two broad topographic divisions within the Buffalo Metropolitan Study Area. One of these is the Lake Plain, a relatively flat and fertile agricultural belt which is wide in the northern portion of the region but narrow in the south. The other is the Allegheny Plateau, an upland area of rolling hills and scattered woodland tracts interspersed with agricultural acreage. Generally, the Lake Plain supports a wildlife resource typical of that associated with agricultural development, while the heavily vegetated Allegheny Plateau predominantly supports a woodland type wildlife resource.

The northern and western part of the region, exclusive of urban and industrial zones, contains some of the best openland wildlife habitat in New York State. Extensive orchards, vineyards, and truck gardens are mixed with dairy farms and general farming areas. Swamps, marshes, woodlots, and old fields offer protective cover although there are some areas where cultivation is so intense that localized shortages do occur. The ring-necked pheasant and the cottontail rabbit are the two most important agricultural wildlife species. Natural reproduction of the former is good in this part of the region despite the fact that considerable stocking is still being performed. Squirrels are generally restricted to the farm woodlots. Other wildlife species including the woodchuck and fur bearers such as the skunk, red fox, and opossum are also found in this area.

Woodland wildlife in the region includes white-tailed deer, ruffed grouse, red and gray squirrels, snowshoe rabbit, wild turkey, and occasionally bobcat. Deer, cottontail rabbit, red fox, raccoon, skunk, opossum, woodchuck,

and a variety of songbirds are found throughout the region, and frequent both woodland and openland vegetative cover types and peripheral areas around marshlands. Ruffed grouse, wild turkey, and snowshoe rabbit populations are generally confined to the more heavily wooded southern portion of the region in Erie, Wyoming, Cattaraugus, and Allegany Counties. Woodcock utilize grassy fields, meadows and lowland woods in the watershed for food and cover - particularly in the vicinity of more poorly drained soil types.

Aquatic wildlife in the region includes migratory waterfowl, shore and marsh birds, as well as aquatic and semi-aquatic fur bearers such as the muskrat, mink, raccoon, and beaver. These species find suitable habitat in the scattered marshes along the Niagara River and Lake Erie coastline. Numerous small marshes have also been created by the New York State Department of Environmental Conservation to increase the area of productive wetland for wildlife.

The fishery habitat of the region is quite diverse since it includes parts of two of the Great Lakes (Erie and Ontario), the Niagara River, and numerous tributary rivers and streams. Lake Erie, the shallowest of the Great Lakes and one of the most productive, supports an important sport fishery and to some extent a commercial fishery. Lake Ontario also supports a sport and commercial fishery. The Niagara River supports a well-utilized sport fishery. Some of the most important fish species found in Lake Erie, Lake Ontario, and the Niagara River are the coho and chinook salmon, rainbow and steelhead trout, brown trout, northern pike, muskellunge, largemouth and smallmouth bass, yellow perch, and walleye. Many of these species, especially trout and salmonids are present because of the stocking program of the New York State Department of Environmental Conservation.

Most of the larger streams and creeks of the region originate in the rugged upland of the Allegheny Plateau and then flow across the Lake Plain to enter the Niagara River or Lake Erie. The upper reaches of some of these streams provide habitat for coldwater species, while the lower portions generally support warmwater fish species. Some of the important fish species found in the regional streams are coho and chinook salmon, brook, rainbow and brown trout, largemouth and smallmouth bass, pickerel, and yellow perch.

Flora. The Buffalo Metropolitan Area lies in the deciduous forest ecosystem of North America where both the northern and eastern hardwood forests occur. The northern hardwood forest includes almost all of Niagara County, much of southern Erie County and portions of Cattaraugus County. Maple-beech-birch is the characteristic climax vegetation of this area. The eastern hardwood forest extends southward from the northern one-half of Erie County, and includes a small part of southern Erie County, and parts of Cattaraugus County. This forest region contains two climax types - an elm-ash-cottonwood climax which occurs in the lowlands of northern Erie County and an oak-hickory climax type which occurs in the highlands of extreme southern Erie County and parts of Cattaraugus County.

Along many of the streams in the region a variety of species are found which in part, reflects the alluvial nature of the soils. Black willow, American sycamore, and eastern cottonwood are common riparian species.

A sugar maple-American beech-yellow birch association usually develops on the lower valley slopes, while the upper slopes support an oak-hickory climax forest in relatively undisturbed areas.

Much of the natural forest cover of the area has been removed by agricultural and other land use practices.

## 7. Prior and Ongoing Studies, Reports, and Projects

### a. Flood Management Studies

Prior and ongoing Corps of Engineers flood management studies in the Buffalo Metropolitan Area include:

(1) Ellicott Creek Basin. A restudy of the Ellicott Creek flood management plan was completed in August 1973, and issued in the form of a summary, main report, seven appendices, and an environmental impact statement. This restudy resulted in the recommendation of a flood diversion channel. Extensive recreation proposals were included in the plan. The State of New York did not support this alternative. Subsequently, a reanalysis of channelization alternative was made resulting in selection of a plan which includes a combination of major channelization and diversion channel. Preparation of a Phase I GDM for this alternative was completed in April 1978 and the plan presented in the GDM is being reconsidered by Congress for authorization. The Phase II GDM is expected to be completed in 1980.

(2) Scajaquada Creek Basin. The Phase II GDM presenting alternative designs for flood protection in the Buffalo Metropolitan Area along Scajaquada Creek was completed in May 1976. The recommended plan includes major channelization, levees, sealing of manhole covers, and replacement of culverts. Construction is underway and the project is expected to be completed in 1980.

(3) Cayuga Creek Basin. A Preliminary Feasibility Study of flood management for the Cayuga Creek Watershed was completed in May 1975, and the recommended plan was well within cost limitations to qualify for completion under Section 205 Authority. A Detailed Project Report was prepared under this Authority and completed in July 1979. The project plan is to provide local flood protection in the town of Cheektowaga, NY. The plan consists of concrete walls, earth levees, erosion protection, ponding areas, culvert pipes with flap gates, and some minor channel improvement work all located upstream of Union Road Bridge over Cayuga Creek.

(4) Cazenovia Creek Basin. The feasibility study of flood management alternatives for the Cazenovia Creek Watershed was prepared in March 1975. The recommended plan provides for a combination of flood plain management by local interests, participation in the National Flood Insurance Program and the construction of an ice retention structure. The Office of the Secretary of the Army submitted the report to the Office of Management and Budget on 11 December 1978.

(5) Cattaraugus Creek Basin. Cattaraugus Creek Watershed, primarily a rural area, will be studied under a separate Congressional resolution dated June 1956. However, a project is authorized at the mouth of Cattaraugus Creek in the interest of safe recreational navigation and flood management. A considerable amount of hydrologic data has been developed which is available for the Cattaraugus Creek flood management studies. The Phase II GDM for the authorized project was approved in April 1978. Plans and specifications were finalized in March 1980 and construction is expected to start in June 1981. However, even though the total non-Federal cost-sharing for the project has been agreed to, the funds are not yet available. The plan consists of two breakwaters with a berm at the mouth of Cattaraugus Creek, channel deepening, and facilities for recreational fishing from the breakwaters.

(6) Tonawanda Creek Basin. A Preliminary Feasibility Report on flood management in the Tonawanda Creek Watershed was completed in September 1975. The Final Feasibility Report was submitted to the Division Engineer, North Central in December 1980. The recommended plan provides for two shallow detention reservoirs (normally dry) arranged in series and would consist of two earth embankments with gated outlet works, and emergency spillways and four low training dikes. The embankments would be located on Tonawanda Creek, the downstream embankment at the southerly limits of the city of Batavia and the other about four miles upstream.

(7) Little River and Cayuga Creek, Niagara County. A Detailed Project Report was prepared under Section 205 Authority and completed in March 1980. The project that would have provided adequate local flood protection of Cayuga Island in Niagara Falls, NY, would consist of levees, new storm sewer manholes, drainage ditches, and catch basins. However, the project lacks economic justification and no project will be recommended for construction by the Corps. The project data can be used by local interests if they so desire.

#### b. Navigation Studies

Ongoing Corps of Engineers navigation studies in the Buffalo Metropolitan Area include:

(1) Olcott Harbor, NY. A Final Feasibility Report on Olcott Harbor, NY, was completed by Buffalo District in November 1978. The recommended plan provides for construction of two breakwaters in Lake Ontario near the mouth of Eighteenmile Creek, construction of a jetty and dredging in the lake and creek, all in the interest of recreational navigation. Facilities for recreational fishing from the east breakwater are discussed in the study report and included in the plan. Local interests have also met with Corps personnel to discuss the possibility of providing access to the U. S. East Pier under Section 710 Authority for providing public access for recreational purposes at completed Corps projects. Local interests are experiencing difficulty in obtaining public land access and the 710 study has not started.

(2) Michigan Avenue Bridge Abutments. The advisability of removal of the remaining substructure of a highway bridge that crossed the Buffalo Ship Canal was considered in a Detailed Project Report by the Corps under Section 107 Authority and completed in August 1980. The Selected Plan consists of

removing the east pier and the west abutment to provide a general navigation channel with an authorized project depth of 22.0 feet below low-water datum and a width of 125 feet. Plans and specifications are complete and construction is expected to begin in January 1981 and be completed in April 1981.

(3) Buffalo Harbor, NY. A reconnaissance study to determine the feasibility of modifying the Buffalo Harbor, NY, project is expected to be completed in March 1981.

c. Shore Protection Studies

Ongoing Corps of Engineers shore protection studies in the Buffalo Metropolitan Area include:

(1) Lake Erie at Angola, NY. A report, prepared under Section 14 Authority, was completed and a project was constructed in November 1979. The project consists of a stone dike to protect the Water Treatment Plant on Lake Erie that serves the village of Angola, NY.

(2) Lake Ontario Shoreline Study. A reconnaissance study to determine the feasibility of protecting the Lake Ontario shoreline by structural or regulatory measures was started in December 1978 and completed in August 1980. The study, authorized by Section 180(a) of Public Law 94-587 and known as the "Lake Ontario Protection Act of 1976," has as its purpose, the development of methods to assure maximum protection of the natural environment and to hold shoreline damage to a minimum. A total of \$2,000,000 has been appropriated for development of the reconnaissance report, preliminary feasibility report, and final feasibility report. The Final Feasibility Report is scheduled for completion in September 1985.

(3) Cattaraugus Creek and New York State Thruway. A reconnaissance study to determine the feasibility of protecting the Thruway Bridge abutment with steel sheet pile has been completed under Section 14 Authority and favorable action on the report could allow construction to start in 1980.

(4) Wendt Beach, NY. A reconnaissance study to determine the feasibility of protecting public use facilities at Wendt Beach, NY, under Section 14 Authority, is in progress and is expected to be completed in 1980 and the project constructed in the spring of 1981.

d. Pollution Control Study

Ongoing Corps of Engineers pollution control study in Lake Erie:

Section 108d of Public Law 92-500 provides authorization for development of a wastewater management program for rehabilitation and environmental repair of Lake Erie. The authority is in addition to other wastewater studies aimed at eliminating pollution emanating from select sources around Lake Erie. A total of \$5,000,000 has been appropriated for the study expected to be completed in FY 1982. The major emphasis is to reduce the amount of phosphorus from nonpoint sources from entering Lake Erie since phosphates have been determined to be the limiting nutrients.

e. Buffalo Urban Water Supply System Study

The Corps of Engineers, the city of Buffalo, and the New York State Department of Environmental Conservation, have developed a scope of work for an AE to prepare an information report that can be used to help obtain Federal and State authorization programs and financial assistance for rehabilitation of the existing water supply system of the city of Buffalo, NY. The work is being accomplished under Section 214 of Public Law 89-298 authority and funding. The information report is expected to be completed in the spring of 1981.

f. Miscellaneous Projects of Others

The Erie-Niagara Counties Regional Planning Board carries out an active program of planning studies in the study area. Among their reports utilized in the study were the Regional Storm Drainage Management Plan, the Regional Recreation and Open Space Plan, the Land Use Concept Plan, and the Urban River report which presents a development plan for a portion of the Niagara River within the study area. A project known as the riverwalk evolved from the Urban River report and portions have been constructed and contracts let for construction of other features of the project. A path for bikers, hikers, joggers, fishermen, and others desiring access to the waterfront was completed in 1978, in the vicinity of LaSalle Park in the city of Buffalo. A construction contract has been let for a pedestrian bridge over the Niagara section of the New York State Thruway to provide access from Riverside Park in Buffalo, NY, to the Niagara River. Construction began in 1979 and will be completed in 1980. The Urban Waterfront Advisory Committee meets regularly to discuss and assist in planning of other uncompleted portions of the riverwalk and other developments along the waterfront. The Corps participates when requested.

The town of Amherst is studying the feasibility of constructing a bike path along an abandoned railroad right-of-way that is located between Ellicott Creek Park and the community of East Amherst. The town has recently completed 3.3 miles of bike path along Tonawanda Creek between the communities of Pendleton and Wendleville. The project cost about \$300,000 to construct and includes spot parks, benches, tables, and sanitary facilities.

The city of Tonawanda recently completed a bike path along the east side of Two Mile Creek Road between Nia-Wanda, Veterans Memorial Park, and Fletcher Street. The city is now studying the feasibility of constructing a continuation of the path to connect with Sheridan Park in the town of Tonawanda.

The Niagara Frontier Transportation Committee is developing a masterplan of bikeways for Erie and Niagara Counties. Some of the thrust is to develop an alternative mode of transportation for reducing vehicular traffic in heavily populated areas. The committee has not developed the plan as yet but will engage a consultant to do the detailed planning.

The Erie-Niagara Counties Regional Planning Board has completed a 19-volume report on areawide waste treatment under Section 208 of Public Law 92-500. The report is awaiting certification by the U. S. Environmental Protection Agency and the New York State Department of Environmental Conservation who

are scheduled to complete their certification by December 1979 after which the report will be submitted for signature by the Governor.

The Niagara Frontier Transportation Authority is conducting a Feasibility Study of bulk cargo handling facilities and improvements in Buffalo Outer Harbor. Most of the emphasis is related to coal handling. The study has not been completed and no specific plans have been developed. Some improvements have been made to the NFTA small-boat harbor in the outer harbor that include: new piling, expanded parking, rehabilitation of launch ramp, and construction of a fuel dock.

The Erie-Niagara Basin Regional Water Resources Planning Board developed a comprehensive Water Resources Plan for the Erie-Niagara Basin with the assistance of Harza Engineering Company in 1969. The plan presents a co-ordinated comprehensive development plan to meet the water resource needs of the basin through the year 2020.

The New York State Office of Parks and Recreation has published the Statewide comprehensive recreation plan entitled "Forecast of Outdoor Recreation in New York State - People, Resources, Recreation" in 1973. This report details Statewide recreation needs and plans, and includes an extensive inventory and analysis of basic recreation data.

The city of Buffalo, with the assistance of the consulting firm of L. S. Wegman Company, prepared a report which describes and documents the problems and needs of Delaware Park Lake and lower Scajaquada Creek, and presents a range of alternative solutions. The report has been completed and a construction contract was let in June 1979. The project plan provides for two diversion conduits on the south side of Delaware Park Lake to improve water quality by preventing Scajaquada Creek from flowing into the lake. The work is expected to be completed in May 1981.

The Great Lakes Basin Commission has completed a framework study of the Great Lakes Basin and the Buffalo Metropolitan Area is included in planning area 4.4. The final printing of 25 volumes was completed in 1976.

## CHAPTER II - NEEDS

### 1. Introduction

The Buffalo Metropolitan Study Area, is bounded by Lake Erie, the Niagara River, and Lake Ontario, and drained by an extensive network of streams. Studies in the past have dealt with flood management, navigation, shore protection, and water quality aspects of these water resources. Interviews with individuals and groups, both private and Governmental, indicate that there remain significant problems and important potential resource areas that are undeveloped despite pressing need and demand. Implementation of plans in many areas of concern has been slow and difficult.

This chapter describes overall needs and focuses attention on interest or problem areas of priority concern related to the basic Corps of Engineers missions and to water-oriented recreation, water-related environmental quality, fisheries development, and streambank stabilization that impact on or that are related to the usual Corps efforts. The growth of the region and the Buffalo Metropolitan Area has been accompanied by the creation of many institutions and units of Government with varied and conflicting concerns and responsibilities for development and use of the water resources and lands bordering streams and lakes. Concerns and needs of the citizenry have progressed from primary interest in water for drinking, transportation and power production, to industrial uses, and to use as a vehicle for waste disposal. Present-day concerns are with all of these uses plus major concerns that the resource also be aesthetic, provide good aquatic habitat, and be clean enough for recreational use.

### 2. Overall Needs

The overall water resource needs are for measures to: manage overbank flooding from streams, improve navigation, protect lake shores, control pollution, manage waste, improve water supply, reduce streambank erosion, and enhance the recreation, fisheries, and related environmental quality potential of the waters of the area. To achieve this, it was necessary to identify:

- a. The major centers of flood damage, and streambank and lake erosion;
- b. Areas to improve recreational and commercial navigation;
- c. Causes of pollution and extent of waste treatment needs;
- d. Areas of potable water supply problems;
- e. Access needs to existing parks and facilities; and
- f. Aesthetic and water quality conditions of the waters.

### 3. Specific Needs

#### a. Flood Management

Overbank flooding occurs almost annually on Cazenovia, Cayuga, Tonawanda, Cattaraugus, Scajaguada, and Ellicott Creeks. Most of the flooding occurs in the early spring following snow melt and rain that sheds rapidly into the creek. The effects of ice jams is especially significant on Cazenovia and Cattaraugus Creeks where the jams impede flow, act as a dam and cause the banks to be overtopped by both water and large pieces of ice. Even though ice forms on the other creeks, the ice induced flooding is less severe. There is a need therefore, to reduce flood damage caused by overbank flooding. Some structural measures to satisfy this need are: confining water within banks by levees or floodwalls, impounding water and releasing it later to reduce flood flow, trapping and controlling ice to prevent jams, and removing shoals that cause ice to ground and subsequently develop into ice jams that cause overbank flooding. In some areas where flooding occurs, there is little or no structural development and the need for reduction of flooding is not warranted while in others, extensive development that is flooded and damaged almost annually warrants investigation of measures to reduce the damage.

Damaging flooding along Cazenovia Creek generally occurs during late winter and early spring when major runoff and rainfall on frozen ground frequently combine with ice jamming. Local flooding, particularly in the lower, highly developed, portion of the basin in the vicinity of Union Road is often aggravated by ice jams that cause higher than normal water levels. Flows in the creek that would normally remain within banks under ice-free conditions have resulted in severe flood damages when ice jams temporarily dam the channel. There is a need therefore, to reduce flood damage caused by overbank flooding along Cazenovia Creek. A structural measure to satisfy this need would be to prevent ice breakup during the late winter and early spring from reaching the highly developed area of the lower Cazenovia Creek Basin in West Seneca, NY.

The town of Cheektowaga is subject to almost annual overbank flooding from Cayuga Creek. The flooding causes hardship to residents and businessmen through material damage to property and inaccessibility to businesses. Most of the flooding occurs in the vicinity of Union Road and is generally caused by rapid thawing of snow cover in late winter and early spring, often accelerated by rainfall. Since the ground is still frozen, rapid runoff into Cayuga Creek occurs. There is a need therefore, to reduce flood damage caused by overbank flooding along Cayuga Creek in the vicinity of Union Road, and prevent water from the creek inundating residences, roads, and businesses.

Most tributary creeks in the Tonawanda Creek Watershed flow within their channels even during high flow; however, Tonawanda and Mud Creeks flood frequently and augment flows of other creeks enough to cause them to flood also. The flooding generally occurs in late winter or early spring following snow melt and rapid runoff on frozen ground into the creek. Flooding occurs in the vicinity of Batavia, NY, and in the lower watershed in the towns of Royalton, Newstead, Lockport, Clarence, Pendleton, and Amherst. Most of the

damages occur in the city of Batavia and in the lower watershed. The need is to reduce flood damage caused by overbank flooding of Tonawanda Creek and tributaries through Batavia and in the lower watershed.

A large sand and gravel shoal exists at the mouth of Cattaraugus Creek that impedes flow of the creek into Lake Erie and, during the late winter and early spring during ice breakup, causes ice to ground on the shoal further aggravating the situation. The broken ice forms a dam and causes the creek to rise and overtop the banks near the mouth where a considerable number of summer cottages are located. The need is to reduce flood damage caused by overbank flooding. A structural measure would be to maintain an adequate channel through the shoal to prevent the ice from grounding and thus enable the water to flow into the lake.

The Scajaquada Creek and Ellicott Creek channels are both inadequate to contain the flood flow of late winter and early spring. Most of the damaging effect of overbank flooding on Scajaquada Creek has occurred in the upper reaches in the town of Cheektowaga. Ellicott Creek overflows its banks mostly in the town of Amherst, a highly urbanized area, and causes considerable damage. There is a need, therefore, to reduce flood damage caused by overbank flooding. A structural measure would be to enlarge the channel capacity to contain the flows.

#### b. Navigation

There is a need to provide safe, all-weather, recreational harbors along Lakes Erie and Ontario to not only stimulate the recreation industry but to prevent loss of life and property damage. Access to Cattaraugus Creek on Lake Ontario is limited because of the shoal at the mouth and depths further upstream to facilities limits the use mostly to small shallow draft outboards. During lake storms, the unprotected entrance creates an extremely dangerous environment for craft attempting to enter the creek for refuge. There is a need at Cattaraugus Creek to provide a safe entrance channel to the creek and to provide an adequate channel for two-way traffic in the creek to existing and planned marina facilities. At Olcott Harbor on Lake Ontario, the existing facilities are almost fully utilized with little space available for the increasing number of boaters attracted to the area and accelerated by the Salmonid Stocking Program by New York State. The entrance piers are vertical sheet pile and reflect waves between them so much so that, during storm weather, the channel between piers is more hazardous to boaters than being in the open lake. There is a need at Olcott Harbor to provide more protected mooring space and to provide a safe all-weather entrance channel.

Buffalo Harbor, NY, has a well developed system of breakwaters and channels for commercial traffic. There is a need however to reappraise the facilities to determine if the largest vessels now plying the Great Lakes can be accommodated at Buffalo Harbor. An assessment should also be made of the cargo handling facilities. The need then is to determine if it is advisable to modify the existing harbor at Buffalo in the interest of existing and prospective commerce.

#### c. Shore Protection

There is a need to develop measures to protect the coast of Lake Erie and Lake Ontario from erosion and subsequent damage to structures. Many private homes and public use facilities such as highways, water treatment plants, and public beach facilities are in jeopardy.

#### d. Streambank Erosion

The banks of many streams in the study area are being actively eroded. The upper reaches of the major streams in Erie County generally rise on the Allegheny Plateau. Their streambeds are generally in bedrock, and they develop a large bedload consisting primarily of coarse gravel. The lower reaches of these streams are on the lake plains where the bank material is generally silt or clay loams interspersed with alluvium.

The streambanks that consist of loam soils are easily erodible. Differential erosion of the banks induces some meandering characteristics in the streams as they traverse the lake plains. Subsequent deposition of the heavy, gravel bedload along the inner portions of the streambeds reinforces the erosive action of the streams by deflecting the flow more directly into the eroding bank. This stream action takes place chiefly during flood flows so that extensive erosion is a gradual process.

Extensive losses of soil and streambank, varying in amount from a fraction of an acre of land surface to several acres, occurs only during large flood events. Evidence of this can be seen in numerous highway relocations where secondary roads follow stream courses closely. A field reconnaissance was made of selected stream reaches in the study area as shown on Plate 7.

The SCS has provided technical assistance to local interests in providing protection measures at points of special concern but can only enter into project construction if the work is economically justified so as to qualify for Federal cost-sharing. There is a need for the local communities to continue to seek technical assistance from SCS and then to take the necessary action to arrest the erosion.

#### e. Water-Related Environmental Quality

Urbanization has many effects on water-related environmental quality due to land clearing and erosion, wastewater discharges, trash dumping, and discharges from sewer systems. These effects are evident in most of the urban streams in the region. As the urbanizing area around the city of Buffalo continues to expand, it has become increasingly important to recognize the value of the water-related environment and to implement protection and restorative measures.

Water-related environmental quality in the Buffalo Metropolitan Area concerns not only water quality (in terms of dissolved and suspended constituents), but also the uses of the water resource and the environmental surroundings of streams, rivers, and lakes. It is expected that regional and urban water quality, particularly as it is affected by wastewater discharges, will

improve in the future as plans for pollution abatement are formulated and implemented in accordance with requirements of the Federal Water Pollution Control Act. There is a continuing need, therefore, for proper land use planning, including open space and recreation planning along streams, which is an important mechanism by which water-related environmental quality can be restored and preserved. The development of open and green space corridors along streams in the Buffalo Metropolitan Area is an important aspect of this and to have legislation to control water pollution.

#### f. Regional Fishery Resource

The outlook for regional fishery resources in the Buffalo Metropolitan Area is quite promising due to the vigorous three-part management program of the Department of Environmental Conservation of the State of New York (DEC). That organization pursues a program of stocking salmonids in the Great Lakes, trout in selected streams of the study area, and warmwater species in a number of urban ponds. The Department also maintains fish hatcheries and has a program to obtain rights of access to streams for fishermen. The State Office of Parks and Recreation also participates in the cost of recreational boat harbors along Lakes Erie and Ontario in New York State. These harbors provide boat and pier fishing opportunities.

Although sufficient data concerning fishing demand and use for the region are not available to adequately quantify the present situation or predict future needs, discussions with fishermen, DEC personnel, and others indicate that the regional fishery resource is improving and that the interest in and use of this resource will continue to grow.

The fishery resources for the study area consist of both native and stocked warmwater and coldwater species. Populations of northern pike, muskellunge, smallmouth and largemouth bass, yellow perch, and walleye make up the major portion of native sport fishes in Lake Erie, Lake Ontario, the Niagara River, and their tributaries. Native warm fishes such as pickerel, carp, suckers, channel catfish, bullheads, rock bass, white bass, sunfish, crappie, and freshwater drum also are caught in the waters of the region.

Since 1968, the State of New York has been stocking hatchery-raised salmonids to reestablish Lake Erie and Lake Ontario sport fisheries. At the present time, the States of New York, Pennsylvania, Ohio, and Michigan, and the Province of Ontario, Canada, are stocking salmonids in Lake Erie. New York recommends stocking 1,271,600 salmonids and trout in Lakes Erie and Ontario in 1979 as part of the Great Lakes stocking program (Plate 8). As a result of the ongoing stocking program, coho and chinook salmon, rainbow, steelhead, brown and lake trout, as well as splake (hybrids between brook trout and lake trout) are available to anglers fishing in the waters of the region. The New York's Great Lakes salmonid program has produced a mature sport fishery.

The DEC stocks brown and rainbow trout in selected streams in the Erie-Niagara region. The streams stocked are shown on Plate 9. Regional streams that are considered to be trout waters are listed on Plate 9. These are waters that are of sufficient present quality to support coldwater fishes.

Regional streams that support coldwater species as well as those that support warmwater species are illustrated on Plate 10.

The DEC also stocks selected urban ponds in Erie and Niagara Counties with calico bass (crappie). Approximately 12,000 calico bass were stocked in eight ponds in 1979 (Plate 8). These fishes provide a catch-out fishing opportunity primarily for urban youngsters.

The DEC operates several fish hatcheries from which fish are made available for lake or stream stocking. A new hatchery, the Great Lakes Salmonid Hatchery, is being planned to augment the present hatchery production. This new facility will make it possible to increase the level of salmonid stocking in Lake Ontario and Lake Erie.

In addition to the fish stocking activities, the DEC also conducts a stream rights acquisition program within the Erie-Niagara watershed. In this program, the DEC works with landowners to secure rights of access to quality trout streams in Erie, Chautauqua, Wyoming, and Cattaraugus Counties. Approximately 34 miles of streambank access rights have been acquired in this program thus far. A summary of this program is provided on Plate 11.

New York State is also the cooperating agency for Corps small-boat harbors along Lake Erie and Lake Ontario in New York State, for example, Cattaraugus Creek Harbor, NY, and Olcott Harbor, NY. These harbors provide increased opportunity for pier and boat fishing.

The need then is to insure that continuing efforts be made to improve the water for fish habitat and to provide public access to these waters for recreational enjoyment.

#### g. Water-Related Recreation

Recreational resources are fairly well-distributed throughout the study area (Plate 12). However, realization of maximum use and benefit from the abundant recreation resources in the urban area has not occurred primarily because of problems relating to access. There is a need for providing additional and improved access and structural improvements to facilities for safe use of the urban recreation resources. These needs require investigation with the objective of identifying measures that require relatively small capital investments to improve recreational resources which are already in place.

The Niagara River waterfront is the area in which the greatest needs, and also the greatest potential benefits exist. Three characteristics of the Niagara River make it an important recreational source: (1) its scenic aspects; (2) the improving sport fishery resource; and, (3) the proximity of the waterfront to the densely urbanized Buffalo Metropolitan Area.

Additions and improvements to recreational facilities in adjacent areas are also needed including the Buffalo Outer Harbor, Cazenovia Creek, and Delaware Park Lake.

#### **h. Other Water Resource Needs**

There are three other major needs that are already being actively dealt with in the region: wastewater management, water supply, and lake restoration. The Erie and Niagara Counties Regional Planning Board (ENCRPB) has been designated by the State of New York as the 208 Water Quality Planning agency for the region. The 208 Areawide Waste Treatment Management Study which began in late 1975, will develop comprehensive alternative plans for meeting the water quality goals of the region. The ENCRPB requested the Buffalo District to be a part of their Technical Advisory Committee for this study effort. Continuing coordination will be maintained with ENCRPB by the Buffalo District because of the Federal interest in reducing pollution to waterways. A 19-volume draft report has been completed and is awaiting certification by USEPA. Their certification is scheduled to be completed in December 1979, after which the report will be submitted for signature by the Governor.

Comprehensive studies of water supply needs in Erie and Niagara Counties were carried out in the late 1960's, and a water supply plan and program, which incorporates these studies, was adopted in 1973 by the Erie and Niagara Counties Regional Planning Board. There is an immediate need to inventory and appraise existing distribution systems and plans to determine measures necessary to insure adequate and safe potable supplies for the future.

The decline in quality of Lake Erie has been well documented and publicized. The study area lies on the eastern terminus of the lake, and the lake is one of the most valuable water resources in the area. Thus, the restoration of the lake is an important water resource need in the study area. At the present time, the Buffalo District, Corps of Engineers, is conducting the Lake Erie Wastewater Management Study to determine what is required to clean up and rehabilitate Lake Erie water quality. The Final Feasibility Report for this study effort will be completed in FY 1982.

#### **i. Some Specific Recreation Access Needs**

Areas with specific recreation access needs were identified and specific investigations are described in the following paragraphs:

##### **Bird Island Pier**

Bird Island Pier is a two-mile long breakwater and retention wall paralleling the U.S. side of the Niagara River Shoreline. The pier and Black Rock Lock control navigation water depths in the Black Rock Channel. The pier from opposite Albany Street to opposite Porter Avenue is constructed of masonry and rubble with the top elevation near Black Rock channel water level. It has deteriorated into an unsafe condition but despite this it attracts fishermen. There have been a number of drownings by persons who fell or were swept from the pier into the fast-flowing Niagara River. In 1975, two persons drowned when they slipped from the pier into the Niagara River, and several persons were rescued from the pier where they had become trapped by wind-driven high water. Past experience indicates that there is little likelihood that continued use of this facility for fishing can be restricted

effectively. There is, therefore, a need to upgrade the pier to provide for relatively safe access.

#### The Niagara Riverfront

Almost the entire riverfront in Buffalo and town of Tonawanda is inaccessible for strolling or other recreational pursuits. The multilane New York State Thruway was built in close proximity to the riverbank thus restricting both available land and access. In several areas where sizable land areas still abut the shoreline, they are occupied by industrial establishments or are being used for municipal functions such as the wastewater treatment plants and the sanitary landfill operation on Squaw Island. There still is a considerable potential and demand for short and long-term developments along this beautiful and important river.

There is a need to provide facilities and means of access to the riverfront area for potential users, especially the nearby urban dwellers. In addition, it is important that areas such as Squaw Island be at least partially devoted to open space use and that existing interior areas such as Riverside Park be reintegrated into a riverfront recreational complex. Construction of a pedestrian bridge from the park over the Thruway to the riverfront was started in 1979 and will be finished in 1980.

#### Scajaquada Creek and Delaware Park

Scajaquada Creek is the only creek of the area whose watershed is entirely within the urbanized area. It has most of the problems which beset urban streams. There is flooding and water quality is very poor due to sewer overflows and careless disposal of solid wastes and debris along the banks. However, flooding conditions upstream will be greatly alleviated by the Corps of Engineers project, to be completed in 1979, for channel improvements to Scajaquada Creek and Tributaries, NY. The central reach of the stream passes through a four-mile long tunnel constructed some 40 years ago. In the beautiful downstream reach, the city of Buffalo plans to divert the creek around Delaware Park Lake to permit control of lake water quality. The lake presently acts as a trap for stream-borne sediments and debris. The plans for diverting Scajaquada Creek around Delaware Park Lake are complete and a construction contract was awarded in 1979. The work is underway and will be completed in December 1980.

#### Small-Boat Harbors

There is a need for rehabilitation and expansion of the Niagara Frontier Transportation Authority (NFTA) Small-Boat Harbor, located in the Buffalo Outer Harbor, as an integral part of overall metropolitan area recreation facilities. No improvements have been made to the protective structures but the parking lot has been enlarged, the fuel dock improved, launch ramp resurfaced, and some new piling for mooring have made the harbor more usable.

There is a need to reduce excessive wave action in the city of Buffalo's Erie Basin Marina. However, shore protection work along LaSalle Park would help absorb some of the wave energy reflected into the marina if stone riprap is

placed along the LaSalle Park wall. The city was contacted in January 1979, and stated that they have no plans to place stone riprap along the wall.

## CHAPTER III - DISCUSSION, CONCLUSION, RECOMMENDATIONS

### 1. Discussion

The water resource and related land management needs of the Buffalo Metropolitan Area were very carefully assessed and, while some of these needs are being met by ongoing projects, others are unmet. The Corps is or will be meeting some of the needs related to flood management, navigation, shore and streambank protection, wastewater management, and recreation. The U. S. Soil Conservation Services continues to provide technical assistance to local interests at areas where streambank erosion occurs. The U. S. Fish and Wildlife Service and Environmental Protection Agency continue to be guardians of the environment for wildlife and for humans. The U. S. Fish and Wildlife Service and the U. S. Heritage Conservation and Recreation Service provide guidance and, in some instances, funding for recreation purposes such as parks, bike paths, and pier fishing facilities. Several other Federal agencies such as: U. S. Internal Revenue Service - Revenue sharing; U. S. Department of Housing and Urban Development; U. S. Environmental Protection Agency; U. S. Department of Commerce; and the U. S. Department of Transportation are sources of funding for improvement work in the area.

Many State, Regional, county, and local agencies are active in meeting the water resource needs of the Buffalo Metropolitan Area. The N. Y. State Department of Environmental Conservation actively assesses and monitors the environment, as well as participating with the Corps in the cost and maintenance of local flood protection projects, such as the Cayuga, Cazenovia, and Scajaquada Creek projects in the Buffalo Metropolitan Area. The New York State Office of Parks and Recreation participates in the cost of recreational navigation projects such as at Olcott and Cattaraugus Creek Harbors and in other recreational projects that are cost-shared with the U. S. Heritage Conservation and Recreation Service. The Erie and Niagara County Regional Planning Board developed a comprehensive areawide waste treatment management plan under Section 208 of Public Law 92-500. The counties, cities, and local governments are active in environmental monitoring, urban redevelopment, recreation, and development of land use plans.

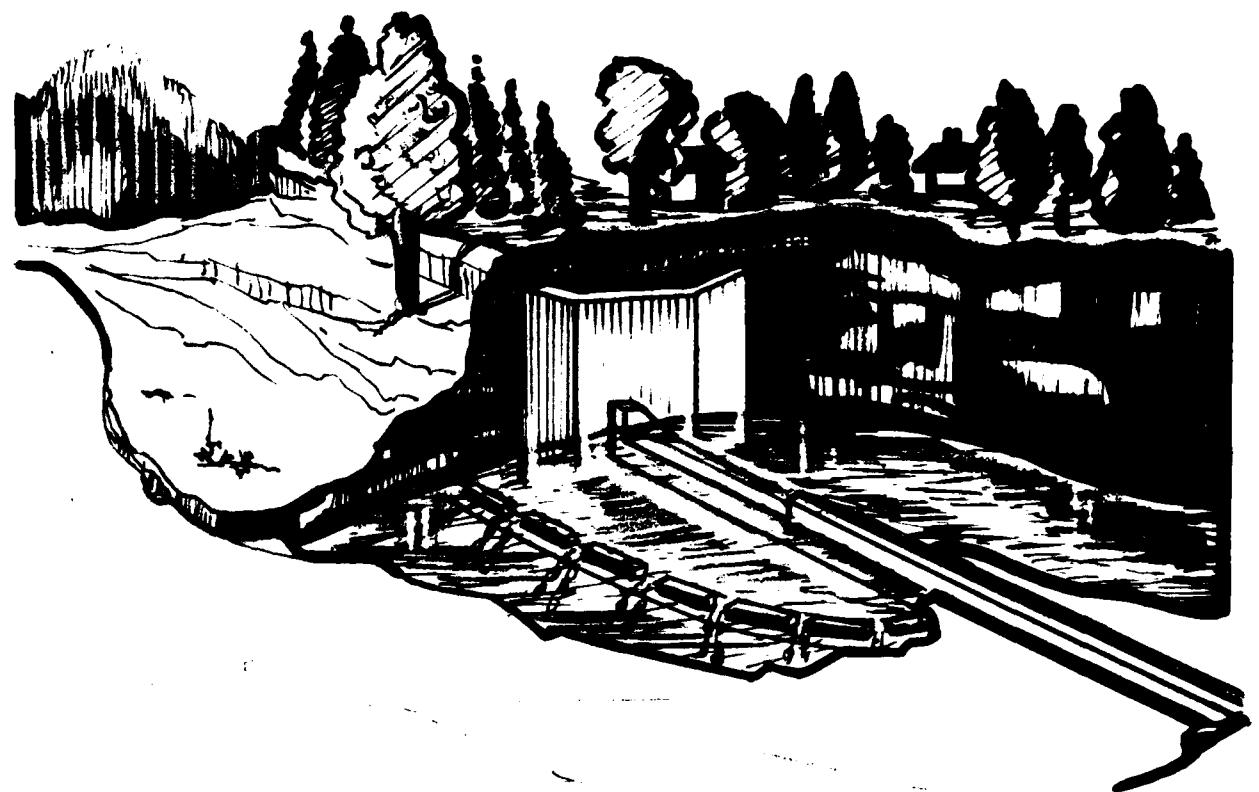
Part of the problem in providing measures to satisfy the water resource and related land management needs in urban areas is caused by rapid development needed to service the increasing population such as: housing, transportation, education, food, clothing, health care facilities, and many other essentials all of which require land use. Runoff from rain and snowmelt becomes more rapid as land becomes occupied by buildings and roads causing increased streamflow with resultant overbank flooding and erosion. Increased population creates greater pollution potential and generates more waste to be managed. Park land and access to the waterfront is replaced by buildings and roads. Many water resource needs will probably be unmet becomes of the usual and normal problems that occur in all urban areas such as the Buffalo Metropolitan Area. However, it is encouraging that all levels of government are working together to satisfy most of the water resource and related land management needs in the Buffalo Metrolitan Area. To illustrate how some of the needs are being met, the following brief discussions and sketches provide an understanding of existing and proposed improvements and those underway.

Plate 13 shows the location of several of the ongoing and proposed improvements in the highly urbanized portion of the Buffalo Metropolitan Area.

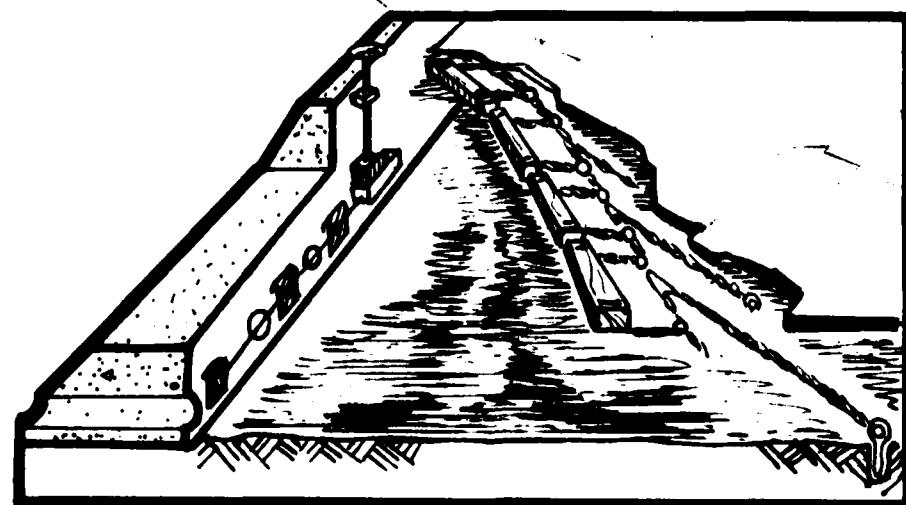
Flooding is the paramount water-related problem in the Cazenovia Creek basin, and damaging flooding along the creek generally occurs during late winter and early spring when major runoff events from snowmelt and rainfall on frozen ground frequently combine with ice jamming. Local flooding, particularly in the lower, intensely developed portion of the basin is often aggravated by ice jams that cause higher than normal stages. Discharges that would be non-damaging under ice-free conditions have resulted in severe flood damages when ice jams temporarily dam the channel. The Corps of Engineers investigated the ice-related flood problems and found that an ice retention structure would best reduce overbank flooding in the town of West Seneca where the greatest amount of flood damage occurs. A sketch of the structure is shown on the following page and the location and associated recreational improvements on Plate 14.

The town of Cheektowaga is subject to almost annual overbank flooding from Cayuga Creek causing hardship to residents and businessmen through material damage to property and inaccessibility to businesses. This is a major water resource problem that occurs almost annually after rapid thawing of snow cover in late winter and early spring, often accelerated by rainfall. Since the ground is still frozen, rapid runoff into Cayuga Creek occurs. Most of the flooding occurs in the lower basin with the major problem in vicinity of the Union Road bridge where overbank flooding occurs immediately upstream of the bridge on the north bank. A high concentration of residential and commercial development is located in this area which becomes severely inundated by the floodwater. The Corps completed a study of the Cayuga Creek Watershed and determined that a floodwall-levee system on the north bank with erosion protection materials on the banks would best reduce overbank flooding in the vicinity of Union Road and William Street in the town of Cheektowaga. A sketch of the proposed improvements is shown on the page following the sketch of the ice retention structure and the details on Plate 15.

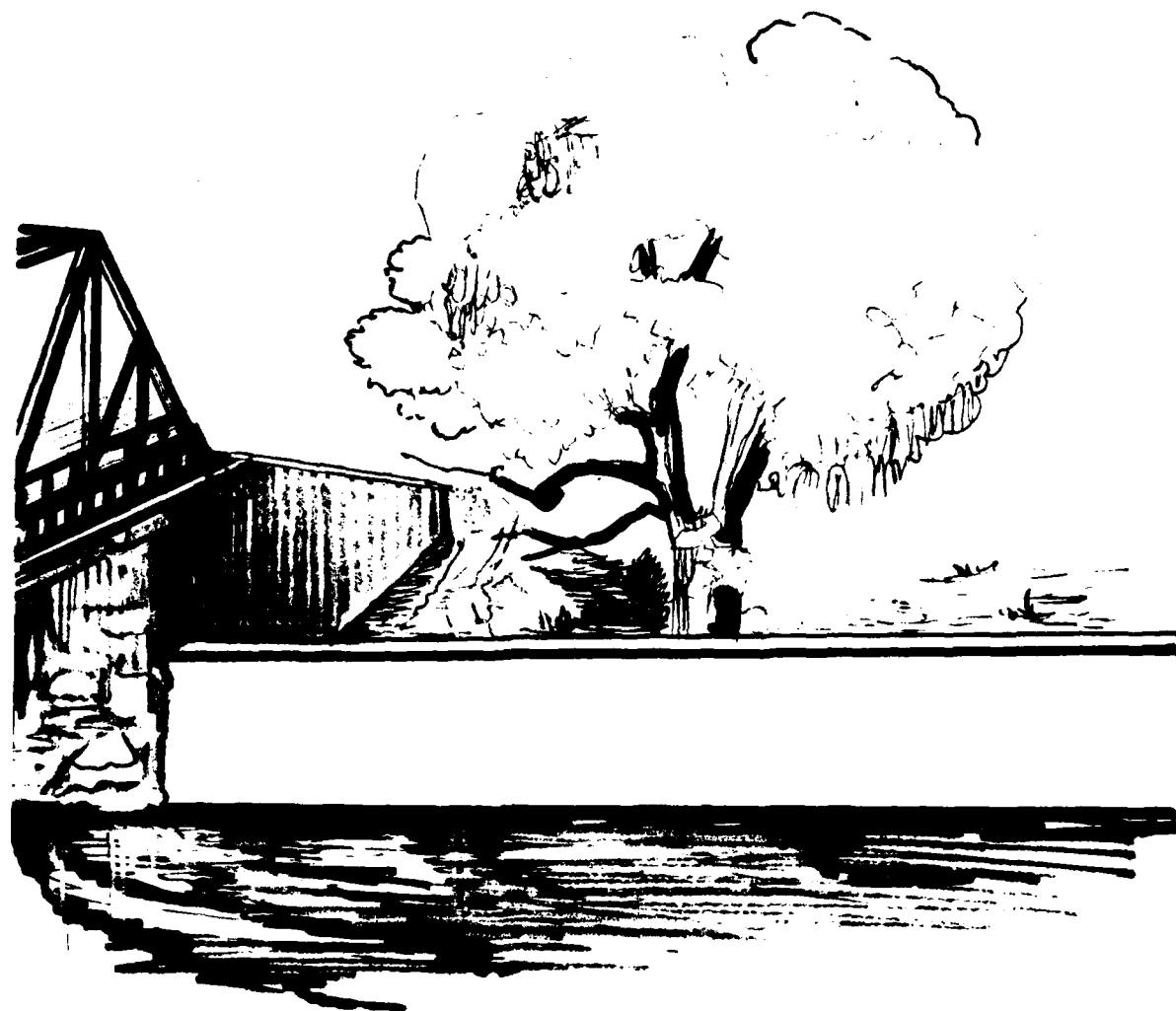
Flooding has caused damage throughout the Tonawanda Creek Watershed for many years. The recent increase in development of forest and farmland for industrial and residential use has increased the need for regional flood management. The specific needs in the basin are to protect human health and life, residential and commercial property, industry, and the environment and recent land use changes within floodlands have increased flood management needs substantially, particularly in the towns of Clarence, Amherst, Pendleton, and Wheatfield, where land is being developed for residential, transportation, and industrial uses. The Corps completed a study of the Tonawanda Creek Watershed and determined that a regional flood management improvement was necessary and developed a system of two detention reservoirs upstream of Batavia, New York. The plan will provide complete protection for the city of Batavia and lesser protection in the lower watershed. A third reservoir system in the vicinity of the Tonawanda Indian Reservation would provide full protection in the lower watershed but the plan was not acceptable to the New York State Department of Environmental Conservation. The Batavia Reservoir Compound (Modified) is depicted in the sketch on the page following the sketch of proposed improvements for Cayuga Creek and the details are shown on Plate 16.



ICE RETENTION STRUCTURE



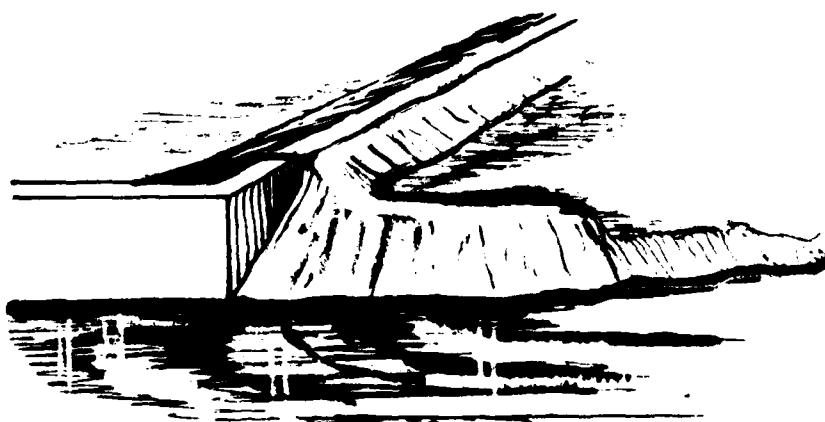
SKETCH 1



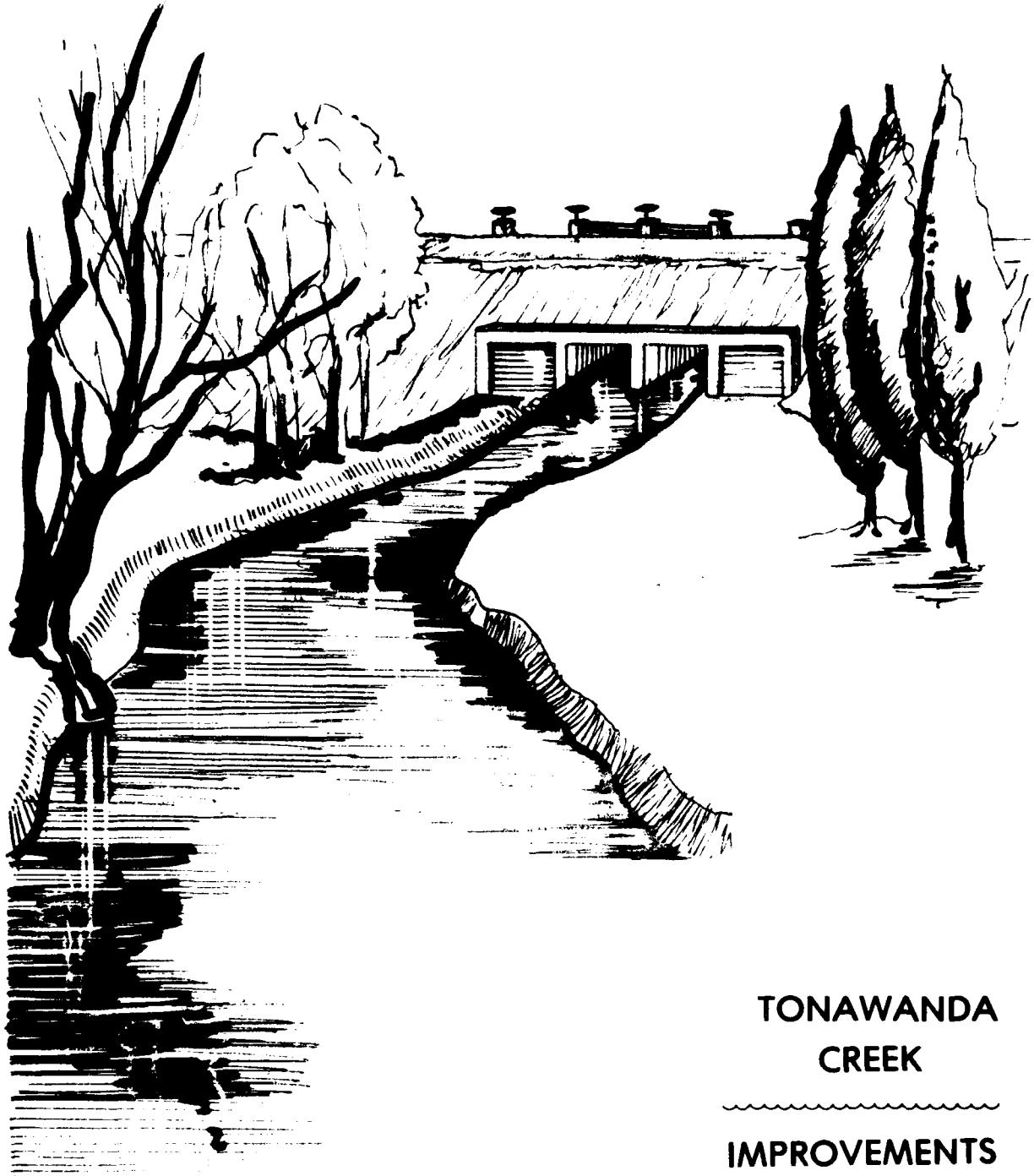
CAYUGA CREEK

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IMPROVEMENTS



SKETCH 2



**TONAWANDA  
CREEK**

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**IMPROVEMENTS**

**SKETCH 3**

Several other types of improvements in the urbanized portion of the Buffalo Metropolitan Area are underway by various levels of government. The Buffalo Sewer Authority held dedication ceremonies for a secondary waste treatment plant on 7 July 1979. The new plant represents an investment of almost \$170,000,000 shared by Federal and State grants, and about \$32,000,000 of the cost will be paid by local users. The authority serves almost 550,000 people via a system of 818 miles of pipe. The secondary plant will treat an average daily flow of 180 million gallons and requires 200 employees for a full three-shift operating day. A sketch of the plant, located on Squaw Island between the Black Rock Canal and the beautiful Niagara River, is shown on the page following Sketch 3. Other treatment plants, but much smaller, are being constructed throughout the Buffalo Metropolitan Area as part of the regional plan developed by the Erie-Niagara Counties Regional Planning Board under Section 208 of Public Law 92-500.

The Town of Tonawanda typifies a modern water supply plant in the Buffalo Metropolitan Area. The town, known as the "Land by the Waters," now boasts a population of more than 100,000 with a wide variety of industrial, commercial, and residential development. Water supply in the town is derived from the fast flowing Niagara River, and the treatment plant has a capacity of 36,000,000 gallons per day. The treatment plant is the only town-owned potable water supply facility in Erie County and provides the lowest metered rates. A sketch of this beautiful facility is shown on the page following Sketch 4. Older water supply systems, such as for the city of Buffalo, are in constant need of repair and rehabilitation. A sketch to illustrate a broken water supply line on a typical, heavily traveled, city street is shown on the page following the sketch of the town of Tonawanda's treatment plant.

The Corps of Engineers is currently engaged in a wastewater management study of Lake Erie that is scheduled for completion in 1981-1982. The major emphasis of the study is to develop methods of reducing the amount of phosphorus, determined to be the limiting nutrient, from nonpoint sources. One of the most promising measures investigated is "reduced tillage" of farmland that reduces considerably the amount of soil sediments containing phosphorous fertilizers from being carried into streams flowing into Lake Erie and from agricultural lands along the lakeshore. This measure being investigated by the Corps would supplement the improvements in wastewater treatment facilities underway in many communities and those that will be constructed as a part of the regional plan developed by the Erie-Niagara Counties Regional Planning Board. Existing methods of tillage require several passes with a plow, disk, harrow, and other farm implements to obtain a fine consistency soil that is highly susceptible to erosion of soil that is usually heavily laden with phosphate fertilizers. Reduced tillage is achieved with a "no-till" planter designed to plant seeds in a field without plowing. The planter has a fertilizer and herbicide applicator with a heavy duty fluted colter or wheel designed to crack open the soil just enough for the seed to drop in. A press wheel follows behind the seeder to close the opening in the soil. A sketch to illustrate reduced tillage is shown on the page following the sketch of the broken water supply line.

Delaware Park Lake is situated on lower Scajaquada Creek in Delaware Park in the city of Buffalo. The park is a large and beautiful multi-purpose urban park with the lake as its focal point. A smaller lake, called North Bay, or

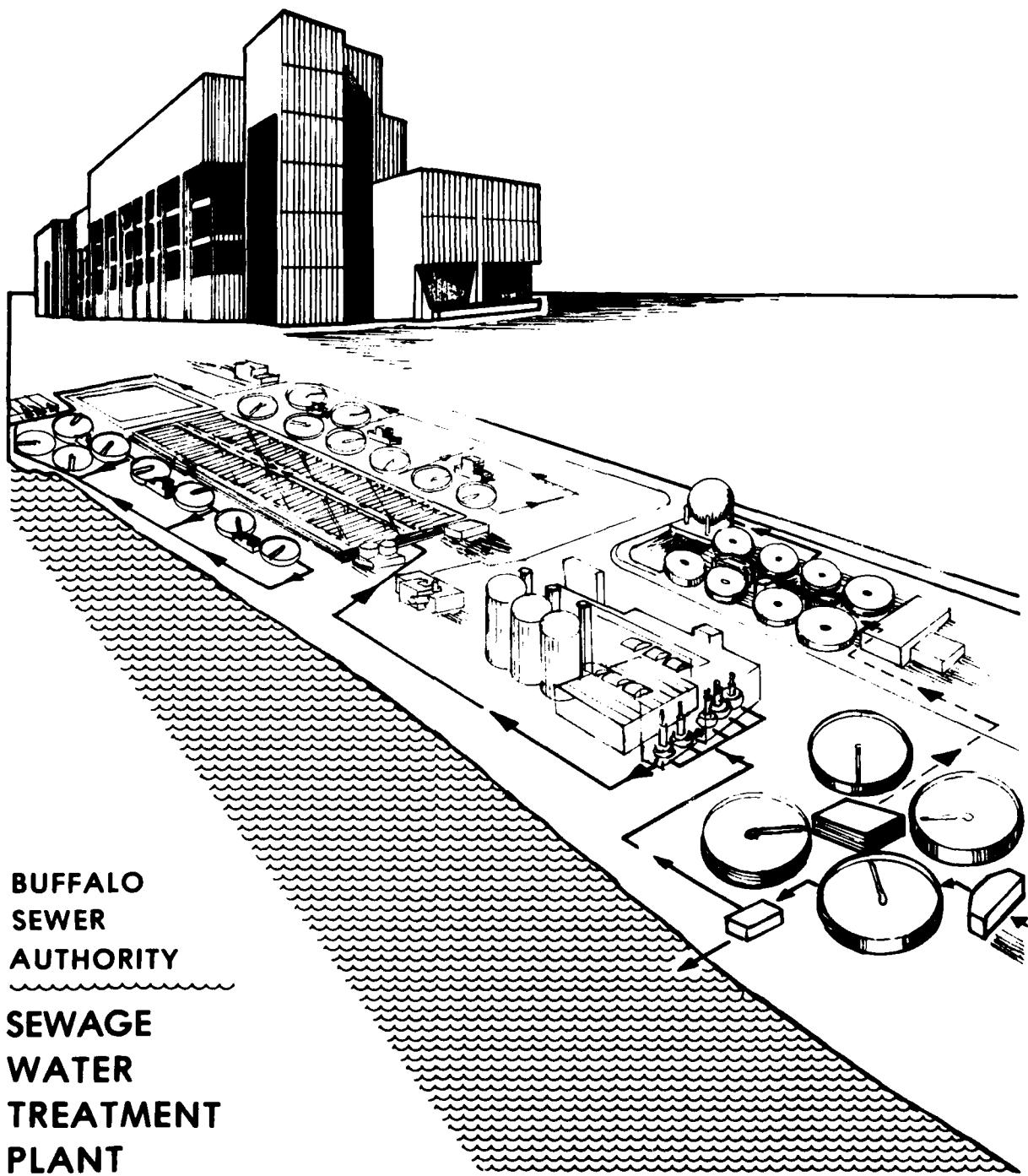
Mirror Lake, is situated just downstream and immediately adjacent to Delaware Park Lake. Sediment, debris, trash, and sewage often flow directly into Delaware Park Lake when the trash rack upstream of the lake clogs and prevents the Scajaquada Creek from diverting to the Delavan Avenue drain that normally carries it to the Black Rock Canal. Preservation and rehabilitation of Delaware Park Lake has been given a high priority by the city of Buffalo, and phase I of a two-phase construction contract is underway that will divert Scajaquada Creek around the creek through two large elliptical covered conduits. The trash and sediments will be removed from the lake, and it will be filled and supplied with spring water. The complete rehabilitation is expected to be completed in 1982. The project, when completed, will represent a major improvement in environmental quality. There will be an improvement in water quality to support fish and wildlife and an aesthetic improvement. A sketch of the lake is shown on the page following Sketch 7.

The Corps of Engineers study report on improving recreation access and related water and land management was completed in April 1979. Throughout the study investigation, close coordination was maintained with all levels of government in the area to insure that all interests would work together to improve the access and use of the area's water resources. Corps personnel met with the Mayor of Tonawanda and suggested a bike path along Two Mile Creek to interconnect Veterans, Nia-Wanda, and Isle View Parks with Sheridan Park. The city of Tonawanda has constructed a bike path along the creek, and the town of Tonawanda will continue to be encouraged to continue the path to Sheridan Park. A sketch of the bike path along Two Mile Creek is shown on the page following the sketch of Delaware Park Lake. Access to the beautiful Niagara River opposite Riverside Park was cut off with construction of the Niagara Section of the Thruway. A pedestrian bridge was needed, and the New York State Department of Transportation has a bridge under construction that will be available for use in the Spring of 1980. A sketch of the bridge that will allow pedestrians safe access to the Niagara River shoreline for recreation purposes is shown on the page following the sketch of the bike path along Two Mile Creek.

## 2. Conclusions

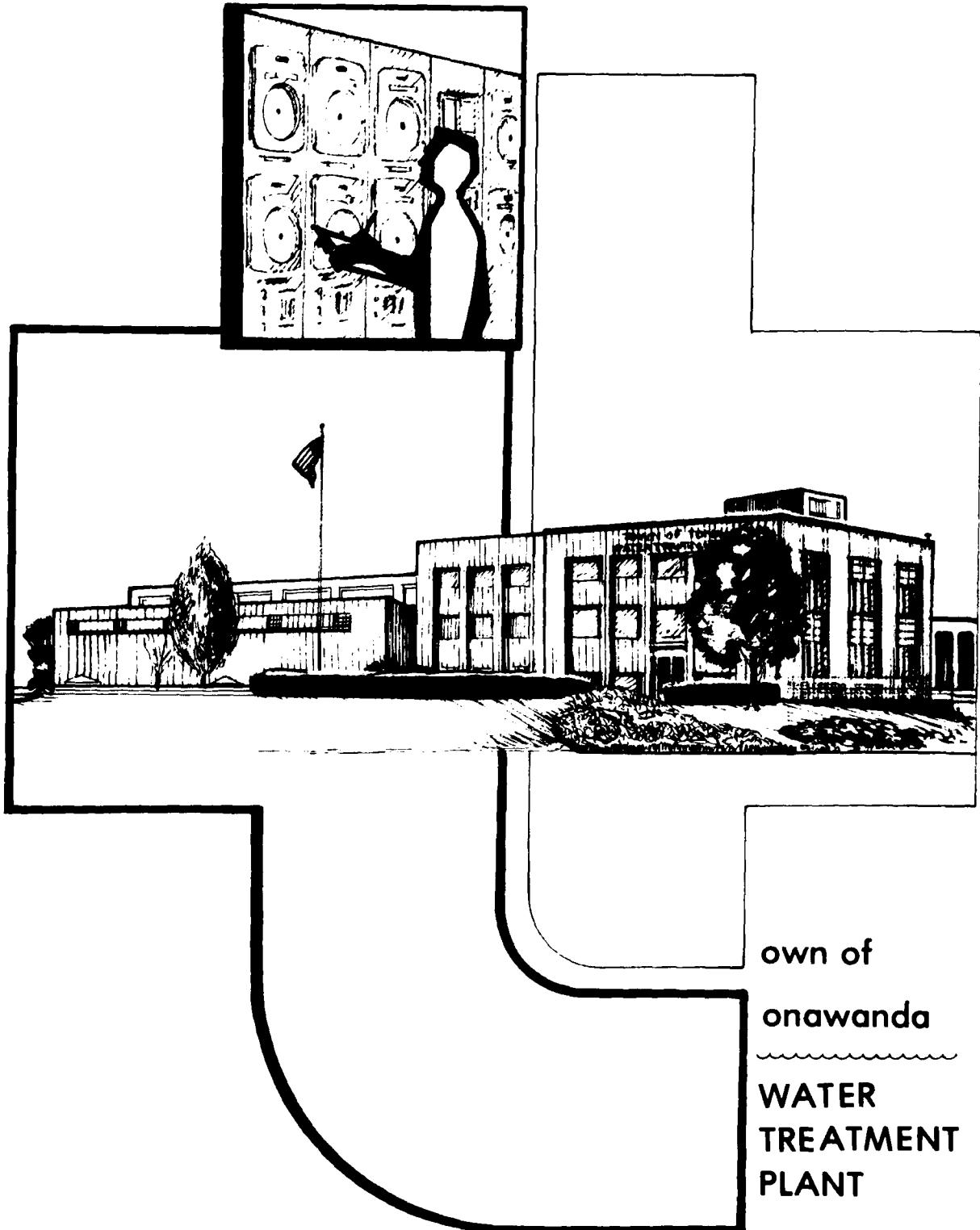
It is concluded that the efforts of the Corps of Engineers, other Federal, State, Regional, county, town, city, and village agencies are in concert attempting to satisfy the immediate and future water resource related needs of the Buffalo Metropolitan Area. Some of the plans developed have become catalysts for future implementation, while some have demonstrated the infeasibility of construction. Many elements of plans for the Metropolitan Area have been completed and others are underway.

The Corps has concluded that they have fully responded to the authorization for the Buffalo Metropolitan Area study having addressed matters related to flood control, wastewater management, water supply, water quality, environmental quality, recreation, and fish and wildlife in the Buffalo River Basin, NY, including the Buffalo Urban Area (SMSA). The Corps has completed three flood control studies and a recreation study in response to the authorization and have also completed a recreational small-boat harbor modification study.

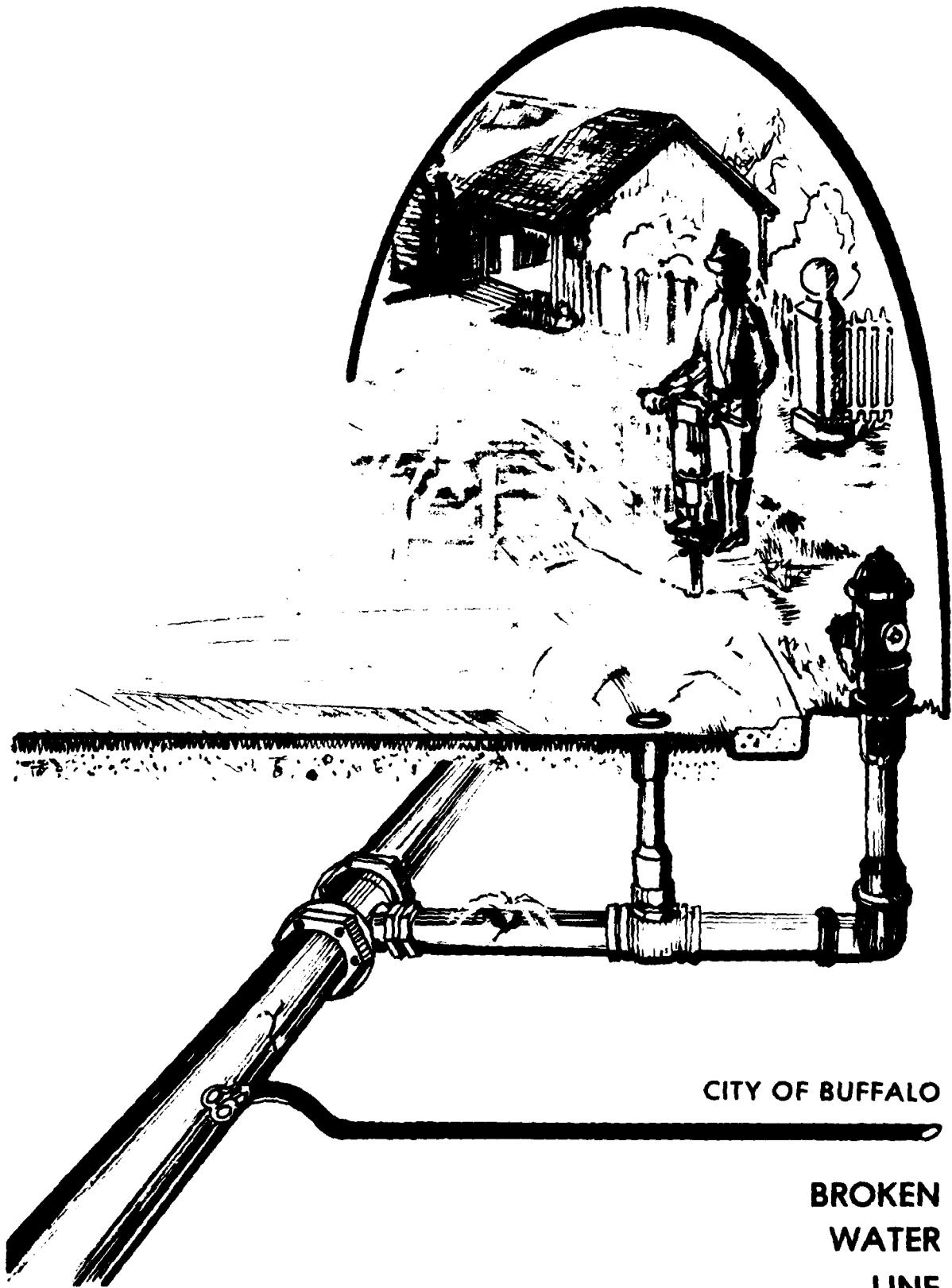


BUFFALO  
SEWER  
AUTHORITY  
SEWAGE  
WATER  
TREATMENT  
PLANT

SKETCH 4



own of  
Tonawanda  
~~~~~  
**WATER  
TREATMENT  
PLANT**



CITY OF BUFFALO

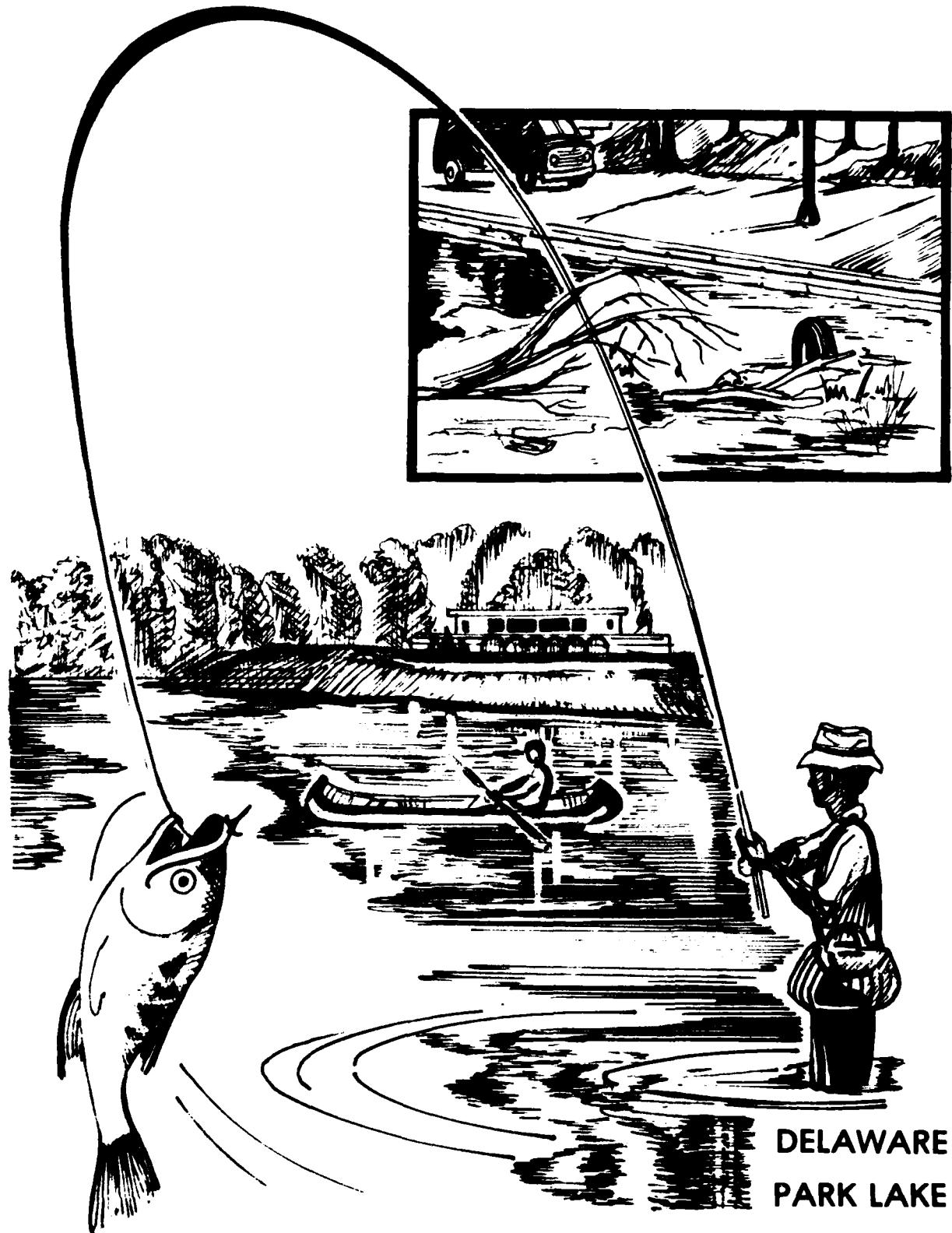
BROKEN  
WATER  
LINE

SKETCH 6



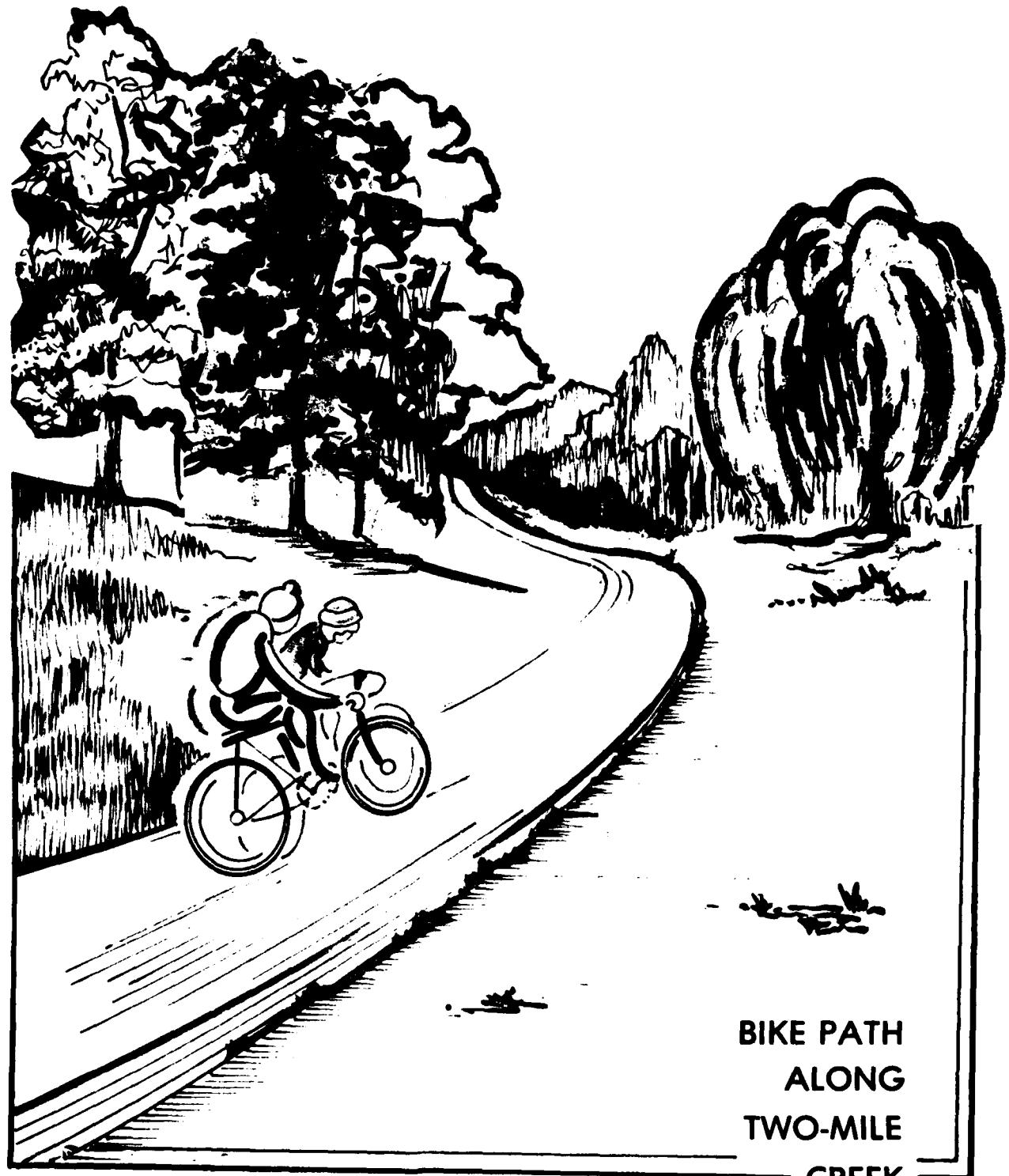
**REDUCED  
TILLAGE**

**SKETCH 7**



**DELAWARE  
PARK LAKE**

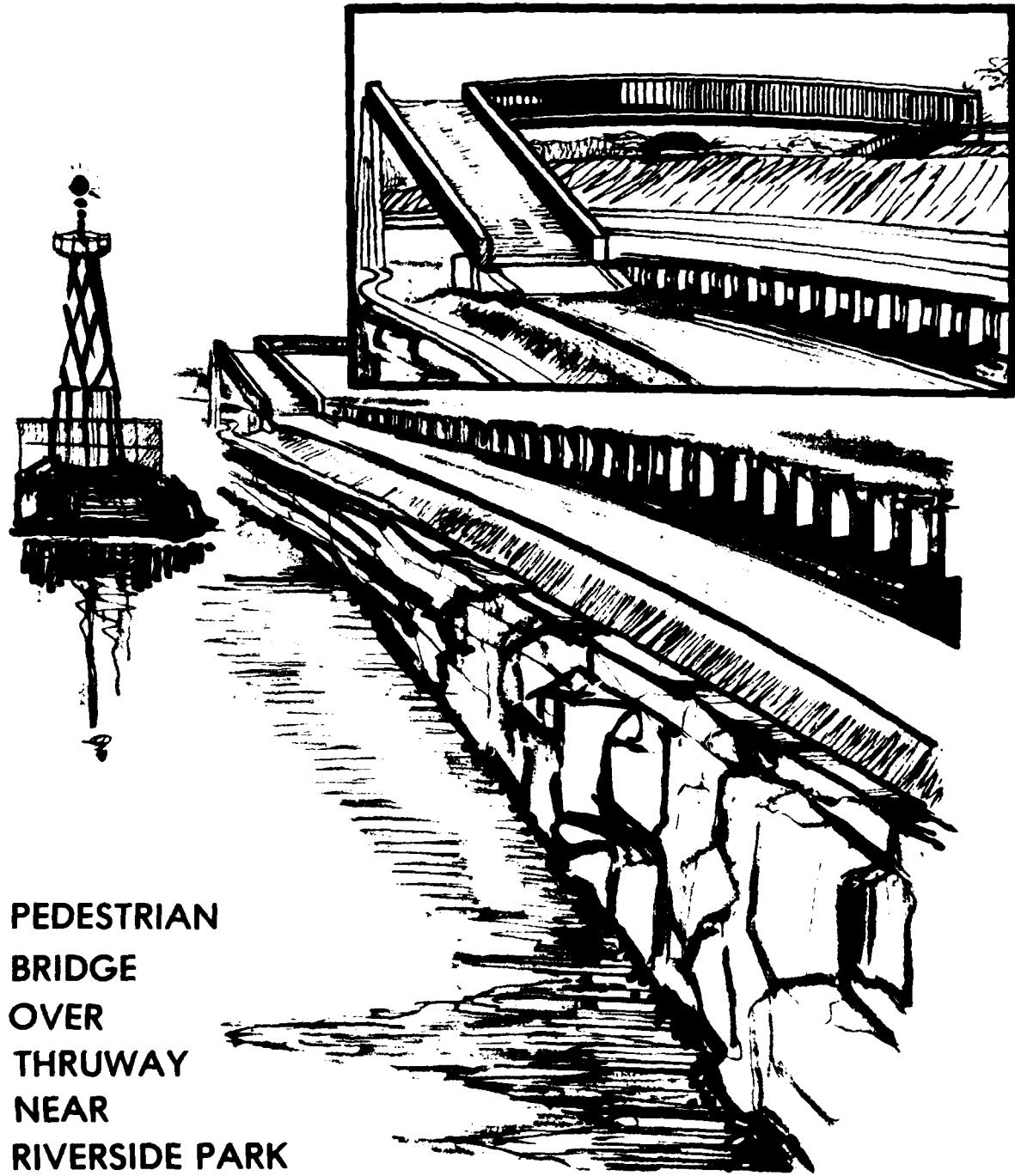
**SKETCH 8**



BIKE PATH  
ALONG  
TWO-MILE  
CREEK

SKETCH 9

**PEDESTRIAN  
BRIDGE  
OVER  
THRUWAY  
NEAR  
RIVERSIDE PARK**



**SKETCH 10**

It is further concluded that the Corps and all other agencies in the area can and will coordinate their planning efforts and expertise to satisfy the water resource related needs in the Buffalo Metropolitan Area. To do this, every effort must be made to communicate with each other each time a need is brought to the attention of an agency. No plan should be implemented without considering the input of other agencies. Careful monitoring of the existing use of water resources use must be continued and become the responsibility of all who live within the Buffalo Metropolitan Area or who have an interest in maintaining the proper use of water resources.

The pedestrian bridge, bike paths, restoration of Delaware Park Lake, modern waste treatment facilities and water treatment plants, and the fish stocking program are all examples of management improvements related to water resources in the Buffalo Metropolitan Area. The efforts of many agencies and levels of government were necessary for this work to be accomplished. Other improvements, still in the planning stage, will be constructed as long as this cooperative spirit continues.

### 3. Recommendations

Pertinent excerpts from the recommendations of the Corps of Engineers resulting from completed studies of Cazenovia, Cayuga, and Tonawanda Creeks, and from the study for improving recreation access and related water and land management in the Buffalo Metropolitan Area are cited below verbatim to those recommended at various levels of Corps review. In addition, excerpts from the recommendations contained in a completed study for modifications to Olcott Harbor, New York, are also cited. The Lake Erie Wastewater Management study is still underway, and the recommendations and Selected Plan are still to be developed.

The recommendations of the Chief of Engineers for Cazenovia Creek watershed are expressed in a letter to the Secretary of the Army and in the views and recommendations of the Board of Engineers for Rivers and Harbors, dated 11 March 1976. Excerpts from each are included on the following pages.

DAEN-CWP-A

SUBJECT: Cazenovia Creek Watershed, New York

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress the report of the Board of Engineers and Harbors, accompanied by the reports of the District and Division Engineers, on Cazenovia Creek Watershed. These reports are in partial response to two resolutions by the Committee on Public Works of the United States House of Representatives, adopted 13 June 1956 and 14 June 1972, and to a resolution by the Committee of Public Works of the United States Senate adopted 10 July 1961. These resolutions requested a review of the report on Cazenovia and Cayuga Creeks published in House Document No. 326, 77th Congress, and other pertinent reports, with a view to determining what improvements for flood control and allied purposes are advisable at this time.
2. The District and Division Engineers recommend authorization of an ice retention structure on Cazenovia Creek in the town of West Seneca, NY, to provide flood protection. The estimated first cost is \$1,137,000, of which \$897,000 would be Federal, and \$240,000 would be non-Federal. Based on an interest rate of 5-7/8 percent and a 100-year period for economic analysis, annual charges are estimated at \$78,400, including \$10,500 for non-Federal operation and maintenance. Average annual benefits are estimated at \$204,300, and the benefit-cost ratio is 2.6. Use of the currently prescribed interest rate of 6-1/8 percent would not significantly affect the economic justification of the recommended project.
3. The Board of Engineers for Rivers and Harbor concurs generally in the findings of the reporting officers and recommends that the proposed flood control improvements be authorized for construction subject to certain items of local cooperation.
4. I concur in the views and recommendations of the Board.

J. W. MORRIS  
Lieutenant General, USA  
Chief of Engineers

DAEN-BR

11 March 1976

SUBJECT: Buffalo Metropolitan Area, Cazenovia Creek Watershed,  
New York

Chief of Engineers  
Department of the Army  
Washington, DC

Plan of improvement. The District Engineer finds that the most practical plan for flood protection would consist primarily of an ice retention structure to be located on Cazenovia Creek, about 1 mile upstream of Union Road in the town of West Seneca. He also finds that flood plain management and flood insurance are advisable. The proposed project will reduce the flooding conditions along Cazenovia Creek in the town of West Seneca and that area in the city of Buffalo which is located above the backwater effects of the Buffalo River. The main features of the recommended plan include a low reinforced concrete gravity dam, a stilling pool, and a floating log boom. The purpose of the plan is to protect against increased stages resulting from ice jams. Protection during periods of excessive runoff is not provided. Therefore, the protection afforded by the proposed improvements would be essentially the same as would exist under normal ice-free conditions, and would be determined by the capacity of the existing channel. Although most of the downstream reaches would have a relatively low degree of protection because of limited channel capacity, the major damage area located in the town of West Seneca would be protected from the 125-year flood.

Economic evaluation. The District Engineer estimates the total first cost of the proposed improvement, based on October 1974 price levels, to be \$1,137,000, of which \$897,000 would be Federal and \$240,000 would be non-Federal. The annual charges, based on a 100-year period for economic analysis and an interest rate of 5-7/8 percent, are estimated at \$78,400. Of this amount, \$53,800 would be Federal and \$24,600, including \$10,500 for maintenance and operation, would be non-Federal. The average annual benefits are estimated at \$204,300, and the benefit-cost ratio is 2.6.

Recommendations of the reporting officers. The District Engineer recommends authorization of improvements for flood control on Cazenovia Creek, NY, generally in accordance with plans described in his report and subject to certain items of local cooperation. The Division Engineer concurs.

Public notice. The Division Engineer issued a public notice stating the recommendations of the reporting officers and affording interested parties an opportunity to present additional information to the Board. Careful consideration has been given to the communications received.

DAEN-BR

SUBJECT: Buffalo Metropolitan Area, Cazenovia Creek Watershed,  
New York

Views and Recommendations of the Board of Engineers for Rivers and Harbors.

**Views.** The Board of Engineers for Rivers and Harbors concurs in general in the views and recommendations of the reporting officers. The recommended improvements are economically justified and the requirements of local cooperation are generally appropriate. Non-Federal costs associated with these local requirements are presently estimated at \$240,000 for lands, easements, and rights-of-way, and \$10,500 annually for operation and maintenance of the project works. The Board notes that use of the currently prescribed interest rate of 6-1/8 percent would not significantly affect the economic justification of the recommended project.

The Board believes that sufficient data are available to demonstrate that the use of an ice retention structure for the purpose of alleviating flooding caused by ice jams is feasible, but notes that certain design details of the proposed structure may warrant further consideration. In order to establish final design of the ice retention structure and to verify its structural and functional adequacy, the Board believes that model testing during post-authorization studies is desirable. It is estimated that the cost of a model test would be approximately \$70,000.

The Board notes that the Erie and Niagara Counties Regional Planning Board has a regional recreation plan which includes trailways along both sides of Cazenovia Creek in the vicinity of the project area. It understands that the recreation plan being considered in the comprehensive study now underway for the Buffalo metropolitan area includes bike and nature trails along Cazenovia Creek in the project vicinity. The Board therefore believes that some recreational potential may be afforded by the proposed project. This potential may include the operation of a permanent pool and development of a small day-use recreation area and trails which could serve as an important link between existing and proposed recreation facilities located downstream and upstream. Accordingly, the Board believes that the potential recreational development of this project should be evaluated during the postauthorization studies.

The Board has carefully considered the report as to its compliance with the requirements of the Principles and Standards for Planning Water and Related Land Resources established by the Water Resources Council. It believes that the report conforms to the intent of the Principles and Standards, and that the recommendations of the reporting officers have been developed through the application of prescribed planning procedures contained therein to meet the objectives of national economic development and environmental quality. The effects on regional development and social well-being were evaluated, and the Board believes that the proposed improvements would provide a significant contribution to the regional economy and improvement of social well-being. The Board has also carefully considered the environmental effects, including those discussed in the Revised Draft Environmental Impact Statement dated March 1975, and notes that the proposed improvements are expected to have little adverse environmental effect.

DAEN-BR

SUBJECT: Buffalo Metropolitan Area, Cazenovia Creek Watershed,  
New York

Recommendations. Accordingly, the Board recommends that improvements for flood control be authorized for construction on Cazenovia Creek in the town of West Seneca, NY, generally in accordance with the plan of the District Engineer, and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable. The first cost to the United States for these improvements is presently estimated at \$967,000 for construction, including \$70,000 for a model test. These recommendations are made with the provision that, prior to the commencement of construction, non-Federal interests will agree to:

- a. Provide without cost to the United States all lands, easements, and rights-of-way, including suitable borrow areas and excavated material disposal areas as determined by the Chief of Engineers, necessary for the construction of the project;
- b. Accomplish without cost to the United States all alterations and relocations of buildings, transportation facilities, storm drains, utilities, and other structures and improvements made necessary by the construction;
- c. Hold and save the United States free from damages due to the construction works, not including damages due to the fault or negligence of the United States or its contractors;
- d. Maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army;
- e. At least annually inform affected interests regarding the limitations of the protection afforded by the project;
- f. Prescribe and enforce regulations to prevent obstruction or encroachment on the ice retention structure's flood pool and downstream channels which would reduce their flood control function or hinder maintenance and operation; and
- g. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to insure compatibility between future development and protection levels provided by the project.

FOR THE BOARD:

J. W. MORRIS  
Major General, USA  
Chairman

The recommendation of the District Engineer for alleviation of damage caused by flooding at Cayuga Creek, Cheektowaga, NY, is as follows:

RECOMMENDATION

I recommend that the selected plan of improvement, shown on Plate 4\*, for local flood protection on Cayuga Creek in the town of Cheektowaga, NY, as formulated in this Detailed Project Report, be used as a basis for preparation of plans and specifications for construction, with such modifications as in the discretion of the Chief of Engineers may be advisable, at a total estimated first cost of \$854,000 (August 1977 price levels) consisting of: \$820,000 Corps of Engineers, and \$34,000 non-Federal. This recommendation is made with the understanding that local interests must furnish assurances satisfactory to the Secretary of the Army that they will:

- a. Provide without cost to the United States, all lands, easements, and rights-of-way necessary for construction and subsequent maintenance of the project works. In acquiring lands, easements, and rights-of-way for construction and subsequent maintenance of the project, the State of New York will comply with the applicable provisions of the "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970," Public Law 91-646, approved 2 January 1971, and prohibit future development within ponding areas;
- b. Hold and save the United States free from damages due to the construction and maintenance of the works except for damages due to the fault or negligence of the Government or its Contractors;
- c. Take over, maintain, and operate the project after completion, in accordance with regulations prescribed by the Secretary of the Army;
- d. Accomplish, without cost to the United States, all necessary changes in appurtenant utilities, sewers, and special facilities;
- e. Regulate the use of the flood plain so as not to degrade or encroach on project capacities or hinder maintenance and operation; and
- f. Warn property owners annually that the project does not provide protection against floods greater than the 100-year flood elevation; and,
- g. Enact and enforce flood plain management regulations between the upstream and downstream project limits, meeting the standards established by the Federal Emergency Management Agency for the National Insurance Program under the National Flood Insurance Act of 1968 and Flood Disaster Act of 1973.

\*Plate 15 in this Summary Report.

GEORGE P. JOHNSON  
Colonel, Corps of Engineers  
District Engineer  
Buffalo, New York

The description of the Selected Plan for flood management in the Tonawanda Creek Watershed and the District Engineer's recommendations are cited below and on the following page.

THE SELECTED PLAN FOR FLOOD  
MANAGEMENT IN THE TONAWANDA CREEK WATERSHED

The Batavia Reservoir Compound (Modified), shown on Plate 16, would consist of two shallow detention reservoirs (normally dry) arranged in series. The plan would require construction of two earth dams, each with its own principal outlet works and emergency spillway and the lower dam with four training dikes. Snags and debris jams in the channel of Tonawanda Creek within the compound area would be removed to insure natural channel capacity of approximately 2,000 cubic feet per second. The two reservoirs would include a tract of roughly 4,865 acres within the floodland between the village of Alexander and the city of Batavia. In addition, about 700 acres of land will be acquired outside the project area for fish and wildlife management purposes to compensate for damages to fish and wildlife that might occur as a result of construction and operation of the flood management project.

The upper dam, about 5,450 feet in length, would be adjacent to, and downstream from, an embankment of Conrail Railroad, and would stand approximately as high as the embankment.

The principal outlet works of the upper reservoir would be located in its dam, at or near its intersection with the Tonawanda Creek channel. These outlet works would include five closed conduits, side-by-side, each equipped with an electrically operable gate. The maximum opening of each would be 11 feet by 11 feet.

The emergency spillway of the upper reservoir would be riprapped and extend across the top of the dam. The spillway would have capacity to discharge the SPF flood flow.

Land to be used for the upper reservoir would include about 945 acres of farmland, wetland, and woodland. Fifty acres of this land would be purchased, and flowage easements would be obtained for 895 acres. No buildings are located within this tract; however, 10 buildings situated in the upper reservoir area might be included within the headwater fringe of floodpools caused by maximum probable flooding. These 10 buildings include two town equipment sheds and eight residences. The town sheds would remain. The eight residences would be purchased and removed. These eight buildings comprise all buildings in the vicinity of the upper reservoir susceptible to frequent flood damage. The creek channel just upstream from the upper reservoir, in the village of Alexander, would be stabilized as part of the plan if it were determined that the operation of the compound would aggravate erosion there.

The lower dam would be located upstream from the abandoned Conrail Railroad embankment. The west end of the dam would be about 500 feet south of the railroad embankment and the east end about 3,100 feet south. The dam would

extend 5,600 feet across the Tonawanda Creek Valley, and the west end of the dam would be about 1,000 feet east of State Route 98. Three training dikes with lengths of 150 feet, 600 feet, and 3,300 feet would be constructed about 500 feet easterly and parallel to State Route 98 and another about 950 feet long would be constructed about 1 mile east of Tonawanda Creek.

The principal outlet works of the lower reservoir would be located in the dam about 900 feet east of the creek channel. They would include four closed conduits, side-by-side, each equipped with an electrically operable gate. The maximum opening of each would be 11 feet by 11 feet.

The lower dam would be designed to function as an emergency spillway. The spillway section, with crest elevation of 900, would be riprapped and extend westward from Creek Road a distance of approximately 4,000 feet and would have capacity to discharge the SPF flood flow. Whatever water passed over the spillway would flow along the course of Tonawanda Creek.

Land to be used for the lower reservoir would include roughly 3,920 acres of principally farmland, wetland, and woodland. This land would be protected by the upper reservoir from flooding of up to 10-year frequency near the upper dam and about a 2-year frequency near the lower dam. About 3,870 acres of the land would remain with private owners who would grant easements permitting possible flooding of it. A total of approximately 50 acres, 37 residences, and four farms and businesses would have to be purchased.

#### RECOMMENDATION

I recommend authorization of the Selected Plan presented herein, as may be modified by the Chief of Engineers, providing for construction of the Batavia Reservoir Compound (Modified), including two flood detention reservoirs on Tonawanda Creek in the towns of Alexander and Batavia, NY; costing the United States an estimated first cost of \$22,680,000, or annually costing the United States \$2,043,000, including \$275,000 for operation, maintenance, and repair.

GEORGE P. JOHNSON  
Colonel, Corps of Engineers  
District Engineer

The recommendations of the Division Engineer, North Central, and related project data resulting from the feasibility study of improving recreation access and related water and land management for the Buffalo Metropolitan Area, New York, are included on the following pages.

DEPARTMENT OF THE ARMY  
North Central Division, Corps of Engineers  
536 South Clark Street  
Chicago, Illinois 60605

NOTICE OF INTERIM FEASIBILITY REPORT ON  
FEASIBILITY OF IMPROVING RECREATION ACCESS AND  
RELATED WATER AND LAND MANAGEMENT FOR THE  
BUFFALO METROPOLITAN AREA, NEW YORK

20 September 1979

Notice is hereby given that the interim feasibility report improving recreation access and related water and land management for the Buffalo Metropolitan Area, New York has been prepared by the District Engineer, Buffalo, New York, and the Division Engineer, North Central Division, Corps of Engineers, U. S. Army.

BACKGROUND

The overall study was authorized by a House Resolution adopted on 14 June 1972, by the House Committee on Public Works. This interim report is one of four studies that comprise the overall Buffalo Metropolitan Area Study. The other three studies are concerned with flood management in the Cayuga, Cazenovia, and Tonawanda Creek Watersheds. This interim report addresses provisions for improving streambank protection, water-related recreation, fish and wildlife management, and water-related environmental quality management. Since the Erie-Niagara Counties Regional Planning Board is developing a comprehensive areawide waste treatment management plan under Section 208 of Public Law 92-500, neither this interim report nor the other reports accomplished by the Corps of Engineers under the Buffalo Metropolitan Area Study authority will include consideration of wastewater and related water quality management in the area.

The Buffalo Metropolitan Area has a valuable and abundant water resource, particularly along the Niagara River, much of which is undeveloped or inaccessible for public use and enjoyment. During this feasibility study, various Federal, State, county, city, and private individuals were consulted and it was determined that the people in the study area desire improvement of water and related land resources for public use. People now bicycle, fish, hike, picnic, sightsee, rest, and boat in the Buffalo Metropolitan Area under unsafe, adverse conditions because of limited facilities, limited access, poor water quality, and an inadequate environmental quality setting.

The specific study objectives reflect the desires repeatedly expressed by study area residents for improved access to and development of streambanks, shorelands, and associated parks. These objectives are:

- a. Provide improved and expanded water-related recreation opportunities;

- b. Conserve and improve fish and wildlife resource;
- c. Preserve, develop, beautify, and restore the quality of the water-related environment; and
- d. Provide streambank stabilization and protection to prevent streambank erosion on specified reaches of streams in the study area.

#### DEVELOPMENT PLAN AND MEASURES CONSIDERED

The Development Plan shown in Table 1 or the staged Development Plan shown in Table 2 would, if implemented, provide increased opportunities for expanded, safe, convenient, and enjoyable public use of water and related land resources in the Buffalo Metropolitan Area. Other improvements to enhance fish and wildlife resources, expand urban fishing opportunities, and to stabilize streambanks are also necessary for full utilization, preservation, and enhancement of water resources in the Metro Area. Both plans are acceptable to local Governments and the general public. The Study has been made in compliance with Principles and Standards developed by the President's Water Resources Council and represents adherence to the National Policy for considering alternative plans for water-related land resources and for evaluating the effects of such plans.

All measures developed in this Study would make efficient and worthwhile use of waterfront lands that should properly be for public use. Development would be in increments as funds become available. The initial development would cause little change in the environment or commitment of resources. Proposed vegetative plantings and improvement of water quality through control of floating drift and streambank debris are plan elements that would improve the natural environment.

Both the Development Plan and the staged Development Plan provide the basis for assessing the extent of Federal interest and funding to support each plan. The plans can be implemented without additional legislation. Appropriations of Federal and local funds are necessary for implementation. The Corps can rehabilitate Bird Island Pier and maintain Black Rock channel to project depth without further legislative actions. These Corps activities are now being accomplished under the operations and maintenance program for the Black Rock Channel and Tonawanda Harbor, NY, project. However, Corps maintenance funds cannot be used for providing a bicycle path and parking area on Squaw Island or for park development by land fill on the Black Rock Canal side of Bird Island Pier opposite LaSalle Park. The U.S. Heritage Conservation and Recreational Service (HCRS) could participate in development of the bicycle path and parking on Squaw Island and the Corps could participate in development of the proposed park development alongside Bird Island Pier under the Code 710 Program for Recreation Development of Completed Projects.

The Final Environmental Statement for operation and maintenance of the Black Rock Channel and Tonawanda Harbor, NY, project was filed with the

Table 1 - Development Plan  
All Costs and Benefits are Based on 1975 Price Levels

Location	Measure	Total Development Costs	Equivalent Annual Benefits	Benefit-Cost Ratio	To Be Implemented by	
Riverside Park, Buffalo to Iserville Park, Tonawanda	C Park construction, bicycle path, walkway overpass, parking, and picnic area	1,293,000	316,000	4.6	Local interests	
Squaw Island and Bird Island Pier	B Pier rehabilitation, bicycle path, parking, park development	1,270,000	163,000	3.0	Local interests Corps of Engr.	
Erie Basin Marina to La Salle Park and Day's Point	C Shore protection in LaSalle Park bicycle path, Day's Point parking	292,000	47,000	7.6	Local interests	
NFTA Small Boat Harbor	C Boat Slips, bicycle path, parking, park development, picnic area	1,987,500	264,800	539,000	2.0	Local interests
Waterfront Ferry Service	Two 25-passenger boats, nine landing docks	165,000	55,000	66,000	1.2	Local interests
Delaware Park Lake	Two extensions of existing bicycle path system	37,000	34,000	382,000	11.2	Local interests
	Increased cost to C of E for maintenance of Black Rock Lock and Channel if Delaware Park Lake is bypassed					
Control of Floating Drift and Streambank Debris	Enforce existing laws and improve if necessary periodic streambank maintenance, Niagara Riverfront maintenance, Niagara Riverfront surveillance			12,000	Corps of Engr.	
Cazenovia Creek	Hiking and nature trail, bicycle path to Cazenovia Port	59,600	45,200	496,100	9.0	Local interests
<b>Total for Development Plan</b>		<b>5,095,100</b>	<b>1,043,500</b>	<b>3,703,100</b>	<b>3.5</b>	

Approximately one-half of the equivalent annual costs are attributable to operation and maintenance of recreation facilities. If these facilities are operated on a regional basis, operation and maintenance costs likely would be less due to economy of scale.

Table 2 - Staged Development Plan

All Costs and Benefits are Based on 1975 Price Levels

Location	Measure	Total Development Costs	Equivalent Annual Costs <sup>1/</sup>	Annual Benefits	Benefit-Cost Ratio	To Be Implemented By
Riverside Park, Buffalo to Levee Park, Tonawanda Squaw Island and Bird Island Pier	A Improvements to existing shoreline, bicycle path, and pedestrian overpass 2/ A Pier rehabilitation, Squaw Island parking 3/	\$ 313,000 \$ 527,000	\$ 114,000 \$ 61,000	\$ 887,000 \$ 240,000	7.8 3.9	Local Interests Local Interests / Corps of Engr.
Erie Basin Marina to LaSalle Park and Bay's Point	A A Day's Point parking, bicycle path 4/	\$ 49,000	\$ 28,000	\$ 316,000	11.3	Local Interest
NFTA Small Boat Harbor	A Bike rehabilitation, bicycle path, parking, picnic area 5/	\$ 172,000	\$ 75,000	\$ 198,000	2.6	Local Interests
Waterfront Ferry Service	Two 25-passenger boats, nine landing docks	\$ 165,000	\$ 55,000	\$ 66,000	1.2	Local Interests
Delaware Park Lake	Two extensions of existing bicycle path system	\$ 37,000	\$ 14,000	\$ 382,000	11.2	Local Interests
Control of Floating Debris and Streambank Debris	Increased cost to C of E for maintenance of Black Rock Lock and Channel if Delaware Park Lake is bypassed	\$ 6/	\$ 12,000	\$ 12,000	-	Corps of Engr.
	Enforce existing laws and improve if necessary periodic streambank maintenance, Niagara Riverfront maintenance, Niagara Riverfront surveillance	\$ 106,500	\$ 45,200	\$ 406,100	9.0	Local Interests
Cazenovia Creek	Hiking and nature trail, bicycle path to Cazenovia Park	\$ 59,600	\$ 530,700	\$ 2,495,100	4.7	Local Interests
<b>Total for the Development Plan</b>		<b>\$ 1,322,600</b>				

1/ Approximately one-half of the equivalent annual costs are attributable to operation and maintenance of recreation facilities. If these facilities are operated on a regional basis by one agency, operation and maintenance costs would be less.  
 2/ A bike path has been constructed from Ni-a-Wanda Park to Fletcher Street along the east side of Two Mile Creek Road and a construction contract for a pedestrian overpass bridge over the Thruway from Riverside Park to the waterfront was awarded in January 1979.  
 3/ About two-thirds of the Bird Island Pier has been rehabilitated by the Corps and handrail installed; work to complete the rehabilitation is continuing.

4/ A bike path was constructed in LaSalle Park along the Black Rock Canal in 1978, between the foot of Carolina Street and Porter Avenue.  
 5/ Some additional parking, a fuel dock, some piling, and improvements to the launch ramp have been provided since 1976.  
 6/ A Construction contract will be awarded in the Spring of 1979 for conduits to bypass Delaware Park Lake.

President's Council on Environmental Quality in 1975. Completion of Bird Island Pier rehabilitation work had been accomplished. The Corps cannot cost-share in recreation facilities along Cazenovia Creek until the recommended ice retention structure becomes an authorized project and local interest and cost-sharing is assured.

All elements of the Development Plan or staged Development Plan, except for the Corps work discussed above, would be the responsibility of local agencies. The local agencies can request, through State agencies, HCRS funds for cost-sharing in Facility costs or any additional planning that may be required. Further, HCRS could cost-share in the proposed recreation facilities along Cazenovia Creek without an authorized Corps project since the facilities interconnect existing public parks. Also, local agencies can request assistance from the U. S. Soil Conservation Service.

As shown in Table 1, development costs on 1975 price levels total \$5.1 million with equivalent average annual costs of \$1.04 million and annual benefits of approximately \$3.7 million. The benefit to cost ratio for full development is 3.5 to 1.0.

Immediate and most pressing needs for recreational facilities, fishery access, control of debris, and streambank stabilization in the Buffalo Metropolitan Area can be met through staged development as shown in Table 2. This combination of improvement, rehabilitation, and suggested administrative measures has a benefit-cost ratio of 4.7 to 1.0 based upon development costs on 1975 price levels of about \$1.3 million. Equivalent average annual benefits are approximately 2.5 million and equivalent average annual costs are approximately \$0.5 million.

The staged development plan differs from the development plan of Table 1, in that it represents a deferral of some features in favor of immediate improvement and rehabilitation of existing resources. The staged development plan would permit deferral of about \$3.8 million of development costs. However, implementation of measures proposed in the staged development plan does not preclude full development of each local area at a later date. This procedure permits development of the waterfront recreation resources at a pace that might better correspond to local financial capability and the availability of funds and programs at the State and Federal levels, while at the same time meeting immediate needs. Some of the development has already been completed. A bike path has been constructed along Two Mile Creek Road between Nia-Wanda-Veterans Memorial Park and Fletcher Street in the city of Tonawanda. The city of Buffalo has recently completed a multi-use recreation path in LaSalle Park along the Black Rock canal from about the foot of Carolina Street to the foot of Porter Avenue, and New York State Department of Transportation has awarded a construction contract for a pedestrian bridge from Riverside Park over the Thruway to allow safe access to the Niagara River. The city of Buffalo is expected to award a construction contract for diverting Scajaquada Creek around Delaware Park Lake, and the Corps of Engineers has rehabilitated Bird Island Pier and installed a guard rail for about two-thirds of its length in the interest of public safety.

to those who continue to venture onto the pier.

The concept of staged development would be important to the waterfront ferry service proposal. The proposal represents an economically viable service that can be developed as a franchise or concession by the appropriate local authority. Implementation of the staged development plan would develop attractive recreation capacity on the waterfront attracting large numbers of people. This is a necessary condition if the ferry service is to be viable. Further development of the local areas would then serve to insure the long-term success of the ferry service.

Implementation of the development measures can contribute significantly to the social well-being and environmental appreciation and enjoyment of the expanding urban population of Buffalo. The measures concentrate upon the Niagara River which is a largely undeveloped natural resource that lies adjacent to a large urban population. This recreation, fishery, and environmental resource can be reached by public transportation and through the proposed improvements, these resources would be made more accessible providing additional access points to safe facilities situated in enjoyable surroundings. Bicycle paths, picnic areas, and new or improved fishing access areas would promote greater public use of the river and its resources.

Aesthetic values would be enhanced by some of the proposed measures. The rehabilitation of Bird Island Pier and the dikes of the Small Boat Harbor would improve the aesthetics of these structures in addition to making them safer and more useable. The creation of additional park land along the waterfront would present aesthetically pleasing areas for public use and enjoyment. Certainly, the control of floating drift and streambank debris would enhance the aesthetic quality of the streams in the region and especially the urban streams.

The Corps of Engineers could participate in the following portions of the Development Plan:

- a. Modification of the Bird Island Pier for public safety (100 percent Federal funding);
- b. Dredging of Black Rock Canal to remove additional sediment deposition for Scajaquada Creek if the creek is by-passed around Delaware Park Lake (100 percent Federal funding); and
- c. Development of recreational facilities along Cazenovia Creek if the flood control improvements recommended in the Cazenovia Interim Report are authorized (50 percent Federal funding).

The HCRS could participate in all of the other elements of the Development Plan except the Waterfront Ferry Service, if the non-Federal agencies apply for assistance through New York State Office of Parks and Recreation and if the State and HCRS approve the request and funds are available.

It is concluded that:

- a. The Development Plan shown in Table 1 and the staged Development Plan shown in Table 2 are feasible from an economic and an engineering standpoint;
- b. Local agencies should request HCRS funds and U. S. Soil Conservation Service assistance as required.
- c. No additional congressional authority is necessary to rehabilitate and maintain Bird Island Pier in the interest of navigation and public safety.
- d. The impact on fishery resources, the erosion effects on Strawberry Island, and the international aspects of any flow pattern changes must be carefully considered in development of any plan for filling in the Niagara River;
- e. The existence of drift and debris in and along the waterways and streams in the Buffalo Metropolitan Area continues and removal and disposal measures are necessary;
- f. The erosion of streambanks in the Buffalo Metropolitan Area is continuing and stabilization measures are necessary;
- g. The fish and wildlife resources of the Buffalo Metropolitan Area have not been fully assessed. Additional information is necessary for proper and full development of fish and wildlife management programs and plans.

#### RECOMMENDATIONS

In view of the above, the report recommendations are:

- a. The Development Plan be implemented, by staged construction if necessary, in accordance with applicable laws, regulations and constraints;
- b. The U. S. Army Corps of Engineers continue to rehabilitate and maintain the Bird Island Pier in the interest of navigation and public safety under the operations and maintenance program for the Black Rock Channel and Tonawanda Harbor, NY;
- c. The U. S. Heritage Conservation and Recreation Service consider participation with non-Federal interests in all aspects of the Development Plan except Corps project maintenance and the Waterfront Ferry Service;
- d. Streambank stabilization be accomplished wherever possible at non-Federal expense except for costs incurred by the U. S. Soil Conservation Service in providing technical assistance within areas of their responsibility; and

e. A Fish and Wildlife Management program and plan be developed by non-Corps interests.

f. The Buffalo District continues to participate on the Technical Advisory Committee of the Erie-Niagara Counties Regional Planning Board (ENCRPB) in conjunction with the area-wide waste treatment management study effort being accomplished by ENCRPB under Section 208 of Public Law 92-500.

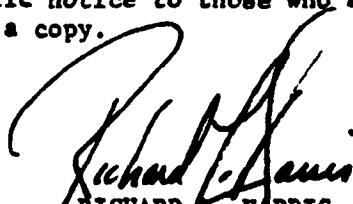
#### REVIEW PROCESS AND ADDITIONAL PUBLIC INPUT

Existing authority is sufficient for the Corps of Engineers to continue to participate on the Technical Advisory Committee and to rehabilitate and maintain the Bird Island Pier. Therefore, the report will not be sent to the Board of Engineers for Rivers and Harbors (BERH) for a Washington level review and transmittal to Congress. Other actions recommended must be implemented locally. The recommendations in this interim report will be included in the final report under the Buffalo Metropolitan Area Study. The Tonawanda Creek Interim and the final report are both scheduled for completion in 1980.

The Buffalo District, Corps of Engineers will accept new data that are specific in nature and bear directly on the study findings. These new data should be presented in writing and should be mailed to reach the District within 30 days of the date of this notice. If extension of this period is desired, a written request stating the reasons for the additional time should be sent to the District as soon as possible.

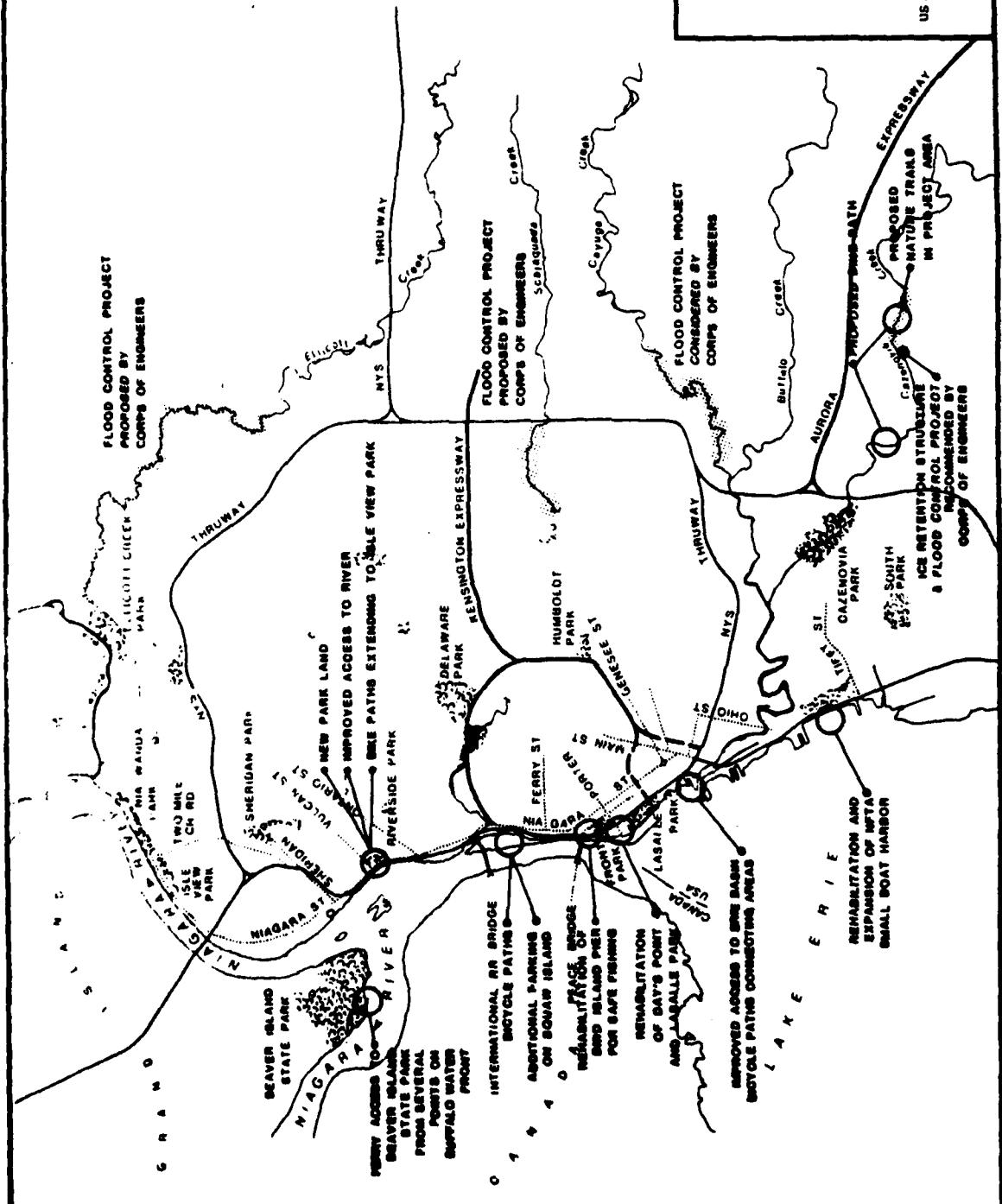
Further information may be obtained from this office or the District Engineer, U. S. Army Engineer District, Buffalo, 1776 Niagara Street, Buffalo, New York 14207. Interested parties, including the press, may make notes of the contents of the report as they desire. Copies of this report will be available, without cost, upon request to the District Engineer, Buffalo, until the limited supply is exhausted. This public notice will be distributed free of charge.

You are requested to give this public notice to those who are interested in this report but did not receive a copy.



RICHARD L. HARRIS  
Major General, USA  
Division Engineer

1 Incl  
Map



III-22

The recommendations of the Board of Engineers for Rivers and Harbors and summary data related to the feasibility study for modification of the Olcott Harbor, New York, study are included below and on the following pages.

BERH-PLN

21 August 1979

SUBJECT: Olcott Harbor, New York

Chief of Engineers  
Department of the Army  
Washington, DC 20314

Summary of Board Action

The Board believes that modifications to the existing Federal navigation project at Olcott Harbor are needed, are economically justified, and are environmentally acceptable. The Board concurs with the reporting officers' plan consisting of two offset breakwaters near the entrance of the existing navigation channel, a new entrance channel, an additional jetty adjoining the existing west jetty, and an access channel in Eighteenmile Creek upstream of the existing project. The east breakwater, by virtue of its alignment, would provide a protected mooring basin accessible via a dredged channel off the new entrance channel. The project construction cost is estimated at \$7,894,000, of which \$4,336,000 would be non-Federal. The benefit-cost ratio is 1.5.

Summary of Report Under Review

Plan of improvement. The District Engineer, upon examining the economic, environmental, and social considerations of the alternatives studied, selected a plan to modify the Federal project which provides the maximum net benefits, best satisfies the planning objectives, and is the one preferred by local interests. The proposed plan consists of two offset breakwaters near the entrance of the existing channel, an additional jetty adjoining the existing west jetty, and an access channel upstream of the existing project in Eighteenmile Creek. The east breakwater, commencing near the mouth of the existing entrance channel, would follow a east-southeasterly alignment for 1,350 feet, then southerly for 300 feet, and be connected to shore by a 150-foot wooden bridge. A protected mooring basin would be provided in the area enclosed by the east breakwater, shore, and existing east jetty. Access to this mooring area would be provided by a 9-foot deep and 100-foot wide channel parallel to the long arm of the breakwater. The east breakwater would have a smooth walkway and a guardrail to accommodate fishermen. The west breakwater would follow a west-southwesterly alignment for 550 feet, then southwesterly for 560 feet. A new entrance channel would be dredged 12 feet deep between the breakwaters and connect with the existing channel. The additional jetty adjoining the existing west jetty on the lakeside would extend 330 feet from shore. The structures, ranging from 16 to 11 feet above low-water datum, would be of rubblemound construction. The dredging of Eighteenmile Creek for a distance of 1,500 feet upstream of the existing project would provide a 9-foot deep and generally 100-foot wide access channel

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SUBJECT: Olcott Harbor, New York

into the inner harbor. A 150-foot square turning basin would also be provided at the upstream end of the channel. About 30,000 cubic yards of highly polluted dredged material from Eighteenmile Creek would be placed in an upland diked disposal area. A 2,300 square yard rock ledge and other bottom material to be dredged from the new entrance channel and access channel paralleling the east breakwater is judged to be suitable for open water disposal and will be placed in deep water about 1 mile offshore.

Economic evaluation. Based on April 1978 price levels, the District Engineer estimates the total first cost for the proposed plan of improvement at \$7,894,000, of which \$3,952,500 would be Federal and \$3,941,500 would be non-Federal. Annual charges, based on an interest rate of 6-5/8 percent and a 50-year period for economic analysis, are estimated at \$599,800, including \$21,600 for operation and maintenance. Average annual benefits are estimated at \$903,500, consisting of \$748,800, including \$21,600 for operation and maintenance. Average annual benefits are estimated at \$903,500, consisting of \$748,800 for navigation, \$138,100 for recreation, and \$16,600 from the utilization of underemployed and unemployed labor in constructing the project. The resultant benefit-cost ratio is 1.5.

Project effects. The proposed project would provide a safe all-weather harbor for a potential 537 boats in the east basin and for 399 boats in the inner harbor in Eighteenmile Creek. It would also provide a harbor of refuge for boats seeking refuge from storms on Lake Ontario. About 20,560 fisherman-days annually will be provided by the project's recreation facilities. The region's underemployment and unemployment problems will be lessened during construction of the project. Dredging will eliminate approximately five acres of benthic habitat. However, about 3.1 acres of aquatic habitat would be created on the submerged sides of the breakwaters and jetty, where the rubble mound provides numerous small spaces. While the removal of polluted sediments in Eighteenmile Creek could release some nutrients and heavy metals into suspension and thereby affect water quality and aquatic organisms, such impacts would be short-term. In the long-term, the removal of this material could lessen the opportunity for these toxins to enter the food chain. The disposal of the 30,000 cubic yards in the 8-acre upland site will eliminate agricultural production on the land for several years. The effluent from the diked disposal area would be ditched to Eighteenmile Creek and Lake Ontario and will cause turbidity at the outfalls. Other effects of the project include: temporary turbidity in the harbor and lake as a result of construction, destruction and displacement of aquatic life, and promotion of commercial and residential development.

Recommendations of the reporting officers. The District Engineer recommends modification of the Federal project at Olcott Harbor, in accordance with the plan described in his report and subject to certain conditions of local cooperation. He further recommends that, if necessary, the improvements for navigation be undertaken independently of providing public recreational fishing facilities whenever the required local cooperation for navigation has been furnished, and that the public fishing development be accomplished if

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SUBJECT: Olcott Harbor, New York

necessary or desirable. The Division Engineer concurs and issued a public notice affording interested parties an opportunity to present additional information to the Board of Engineers for Rivers and Harbors.

Review by the Board of Engineers for Rivers and Harbors

General. The scope of the Board review encompassed the overall technical, economic, social, environmental, and policy aspects involved in the improvement proposed by the District Engineer. The review considered the report's conformance with the essential elements of the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources. The Board also considered the views of all local interests, as well as Federal and State agencies.

Response to the Division Engineer's public notice. The only response to the Division Engineer's public notice was from the New York State Department of Environmental Conservation which reemphasized that its Bureau of Fisheries regards the creation of recreational fishing facilities as an integral part of the project. The Department also expressed hope that its earlier comments regarding possible project impacts on fish spawning, model studies, and mitigative measures would not be forgotten and would receive proper recognition throughout the planning process. The Board gave careful consideration to the Department's comments and notes that the creation of recreational fishing facilities is an integral part of the project. During postauthorization planning studies, the District Engineer will have the Waterways Experiment Station, Vicksburg, MS, develop and test a physical model of his plan which will address several items, including the Department's concerns. Changes in water circulation patterns resulting from breakwater construction will be studied in these models for their effect on spawning routes. The Board believes that project design modifications can be made, if necessary, to minimize such possible impacts and to mitigate such project effects.

Findings and Conclusions. The Board of Engineers for Rivers and Harbors concurs in general in the views and recommendations of the reporting officers. The improvements are economically justified and the requirements of local cooperation are generally appropriate. The Board believes that the District Engineer's proposed plan will provide a significant contribution to the regional economy and improvement of social well-being, and that the beneficial effects will outweigh the potential adverse impacts. Use of the currently prescribed interest rate of 6-7/8 percent would reduce the benefit-cost ratio from 1.5 to 1.4.

The Board notes that the reporting officers adopted the option to not complete a Section 404 (Public Law 92-500) Evaluation Report on the proposed discharge of dredged material from the entrance channel and access channel along the east breakwater, into the open waters of Lake Ontario. Therefore, as provided by Section 404(r) of Public Law 92-500, as amended, they are not seeking an exemption for the proposed discharge through Congressional

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SUBJECT: Olcott Harbor, New York

authorization at this time. The Board believes that since this material is judged to be suitable for open water disposal at this time, this evaluation can be accomplished later.

The President, in his June 1978 water policy message to Congress, proposed several changes in cost sharing for water resources projects to allow states to participate more actively in project implementation decisions. These changes include a cash contribution from benefiting states of 5 percent of first costs of construction assigned to nonvendible project purposes and 10 percent of costs assigned to vendible project purposes. Application of this policy to the Olcott Harbor project requires a contribution from the State of New York of an estimated \$394,700 in cash (5 percent of \$7,894,000 total estimated project first costs assigned to nonvendible project purposes, based on April 1978 price levels). Other items of local cooperation would not be affected by this additional requirement. The total non-Federal cost would change from \$3,941,500 to \$4,336,200, and the total Federal cost would change from \$3,952,500 to \$3,557,800.

Recommendations. Accordingly, the Board recommends that modification of the existing Federal navigation project for Olcott Harbor, NY, be authorized for construction generally in accordance with the plan of the District Engineer with such modifications thereof as in the discretion of the Chief of Engineers may be advisable, and in accordance with the President's proposed cost-sharing policy. The cost to the United States for construction is presently estimated at \$3,557,800. This recommendation is made with the provision that, prior to the commencement of construction, State and local interests will, in addition to the general requirements of law for these types of projects, agree to comply with the following requirements:

a. The State of New York provide a cash contribution equal to 5 percent of the total first cost of the project;

b. Local interests:

(1) Provide without cost to the United States all lands, easements, and rights-of-way necessary for the construction and maintenance of the project and for aids to navigation upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material, and including necessary retaining dikes, bulkheads, and embankments therefor, or the costs of such retaining works;

(2) Hold and save the United States free from damages due to the construction and maintenance of the project, not including damages due to the fault or negligence of the United States or its contractors;

(3) Provide and maintain without cost to the United States adequate berthing areas and local access channels with depths commensurate with those in the Federal improvements, and necessary mooring facilities, utilities, a

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SUBJECT: Olcott Harbor, NY

public landing with suitable supply and essential sanitary facilities, a launching ramp, parking area, and access roads, open to all on equal terms;

(4) Reserve anchorage spaces and mooring facilities adequate for the accommodation of transient craft and craft seeking refuge;

(5) Accomplish without cost to the United States such relocations or alterations of utilities in upland areas as necessary for project purposes;

(6) Establish a competent and properly constituted public body empowered to regulate the use, growth, and development of the harbor with the understanding that public facilities will be open to all on equal terms;

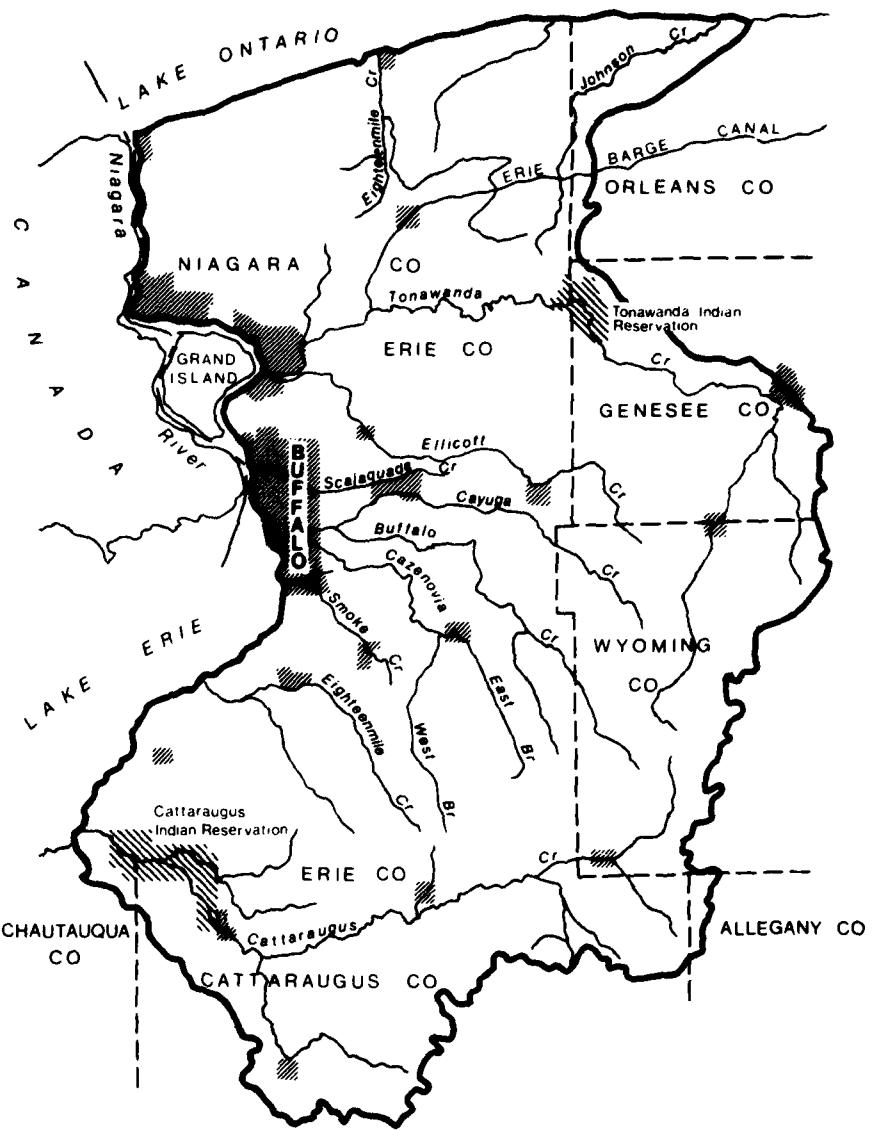
(7) Bear all separable costs of operation, maintenance, and replacements allocated to sport fishing from harbor structures; and

(8) Contribute in cash 50 percent of that portion of the first cost allocated to recreational navigation and fishing, exclusive of aids to navigation, promptly upon receipt of written notice from the Secretary of the Army or his representative. Such contribution is to be paid in a lump sum prior to construction or by installments during the construction period at a rate proportionate to the proposed or scheduled expenditure of Federal funds as required by the Chief of Engineers, the final apportionment of the cost to be made after actual costs have been determined.

FOR THE BOARD:

JAMES A. JOHNSON  
Major General, USA  
Chairman

The recommendations and selected plans of other agencies that have an interest in water resources planning and related land use management in the Buffalo Metropolitan Area are not included in this summary report. Their completed study reports are usually available to the public upon request. However, in most instances, the Corps is fully aware of their plans since the Corps provides technical assistance, and, when requested, develops flood plain information reports, participates in workshops, and in formal public meetings or hearings. It is apparent that many of the recommendations and selected plans of other agencies are being accepted favorably by funding agencies since many are being implemented and are under construction. Some recent construction and some underway include: bike paths, the pedestrian bridge at Riverside Park, urban renewal programs that include waterfront properties, water supply systems, waste treatment facilities, and the enforcement of laws that safeguard the environment. The news media supplements these efforts by conveying a sense of urgency and importance for proper land use planning in the Buffalo Metropolitan Area to maintain a good environment. In summary then, the recommendations and plans of other agencies are generally available upon request or otherwise evidenced by their recent construction. It is apparent that the efforts of other agencies are geared to improve the quality of the water resources and related land use in the Buffalo Metropolitan Area. Further, the Corps recommendations cited in this report reflect the concern of other agencies and interests to improve the quality of water resources and related land use.



**LEGEND**

■ Urban Area

▨ Indian Reservation

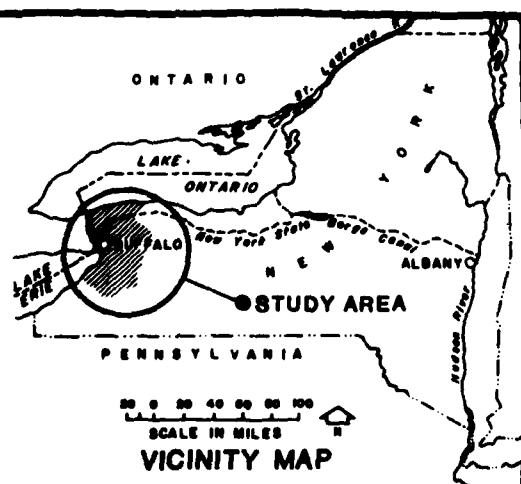
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Scale in Miles

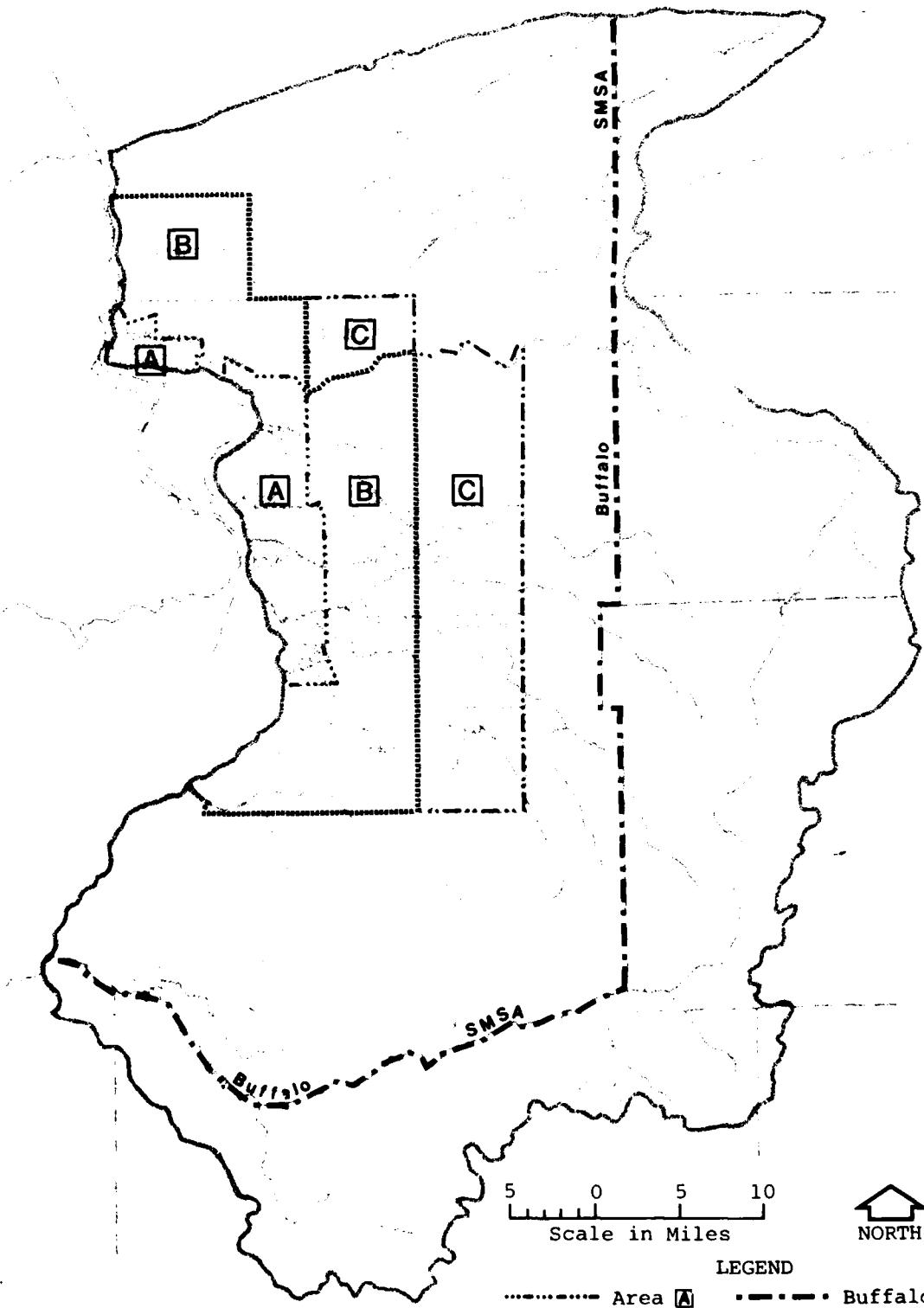


Buffalo Metropolitan Area - New York

**BUFFALO  
METROPOLITAN  
STUDY AREA**

US Army - Corps of Engineers - Buffalo District  
to accompany  
**SUMMARY REPORT**  
**1980**





DISTR

AR

Cities of Buffalo,  
Tonawanda, North  
Niagara Falls, and  
Tonawanda

AR

Towns of Hamburg,  
West Seneca, Cheektowaga,  
Niagara, Wheatfield

**AREA A**

AR

Towns of Aurora,  
Clarence, and Penfield

**AREA A + AR**

Buffalo Metropoli-

Buffalo SMSA  
(Erie and Niagaras)

LEGEND

- Area A
- Area B
- Area C
- Buffalo SMSA
- Urban Area
- Indian Reservation

## DISTRIBUTION OF POPULATION IN URBANIZING PART OF STUDY AREA

	1970 Census Population <u>2/</u>	Percent of Study Area Population	Percent of Buffalo SMSA Population	Percent Projected Growth to Year 2000 <u>3/</u>
<b>AREA A</b> Cities of Buffalo, Lackawanna, Tonawanda, North Tonawanda, and Niagara Falls, and Town of Tonawanda	742,232	52%	55%	-12%
<b>AREA B</b> Towns of Hamburg, Orchard Park, West Seneca, Cheektowaga, Amherst, Niagara, Wheatfield, and Lewistown	357,777	25%	27%	85%
<b>AREA A + AREA B</b>	1,100,009	77%	82%	20%
<b>AREA C</b> Towns of Aurora, Elma, Lancaster, Clarence, and Pendleton	77,972	6%	6%	52%
<b>AREA A + AREA B + AREA C</b>	1,177,981	83%	87%	22%
Buffalo Metropolitan Study Area <u>1/</u>	1,422,200	100%	100%	
Buffalo SMSA (Erie and Niagara Counties) <u>2/</u>	1,349,211	95%	100%	25%

### NOTES

1/ U.S.Army, Corps of Engineers, Buffalo Metropolitan Area Study, Plan of Study, Appendix, Part I

2/ Erie and Niagara Counties Regional Planning Board (ENCRPB) Atlas of Regional Plans and Programs, Summary of Population Projections

3/ ENCRPB Projections

Buffalo Metropolitan Area • New York

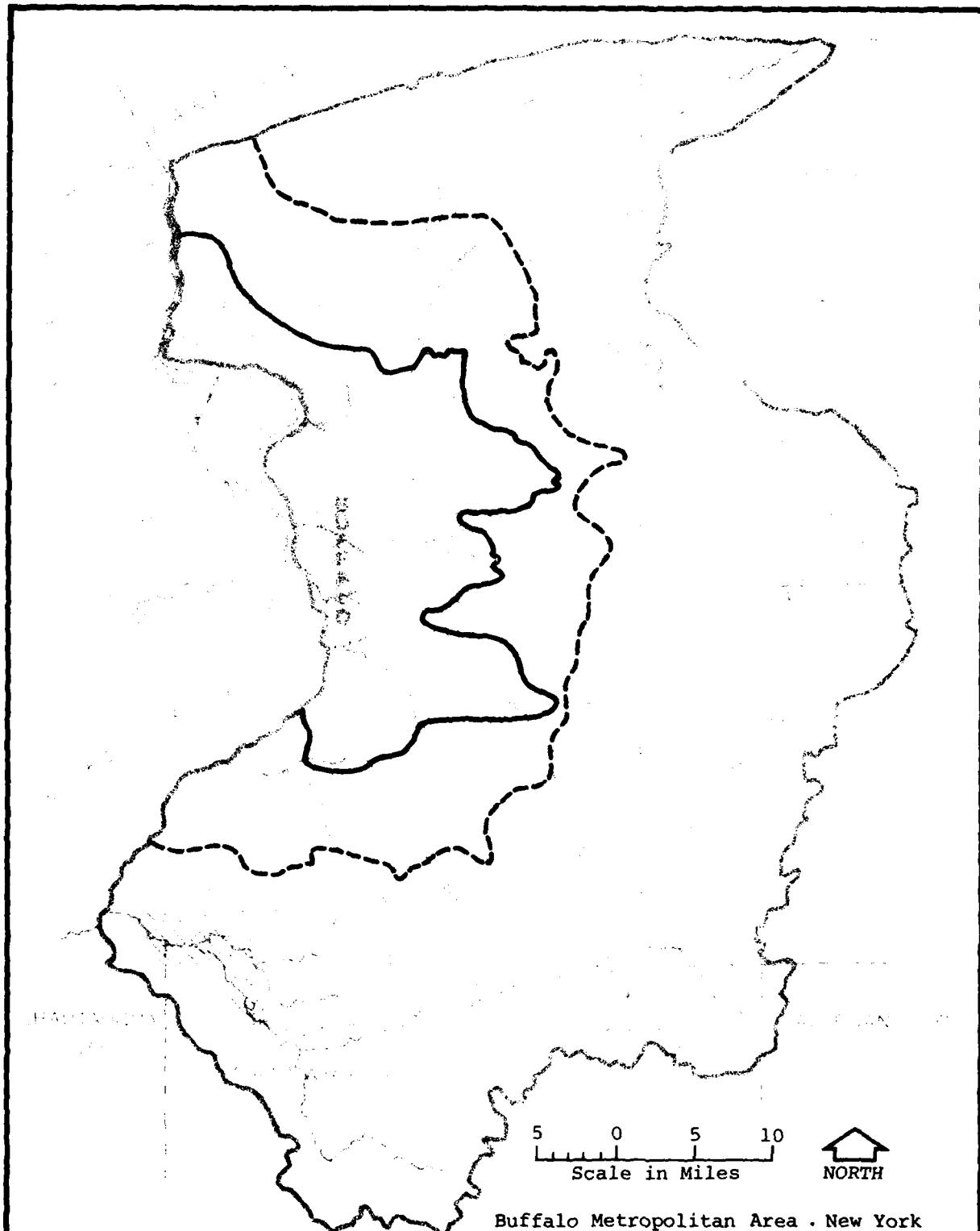
## POPULATION DISTRIBUTION

US Army • Corps of Engineers • Buffalo District  
to accompany

**SUMMARY REPORT  
1980**

**SMSA**  
rea  
eservation

PLATE 2



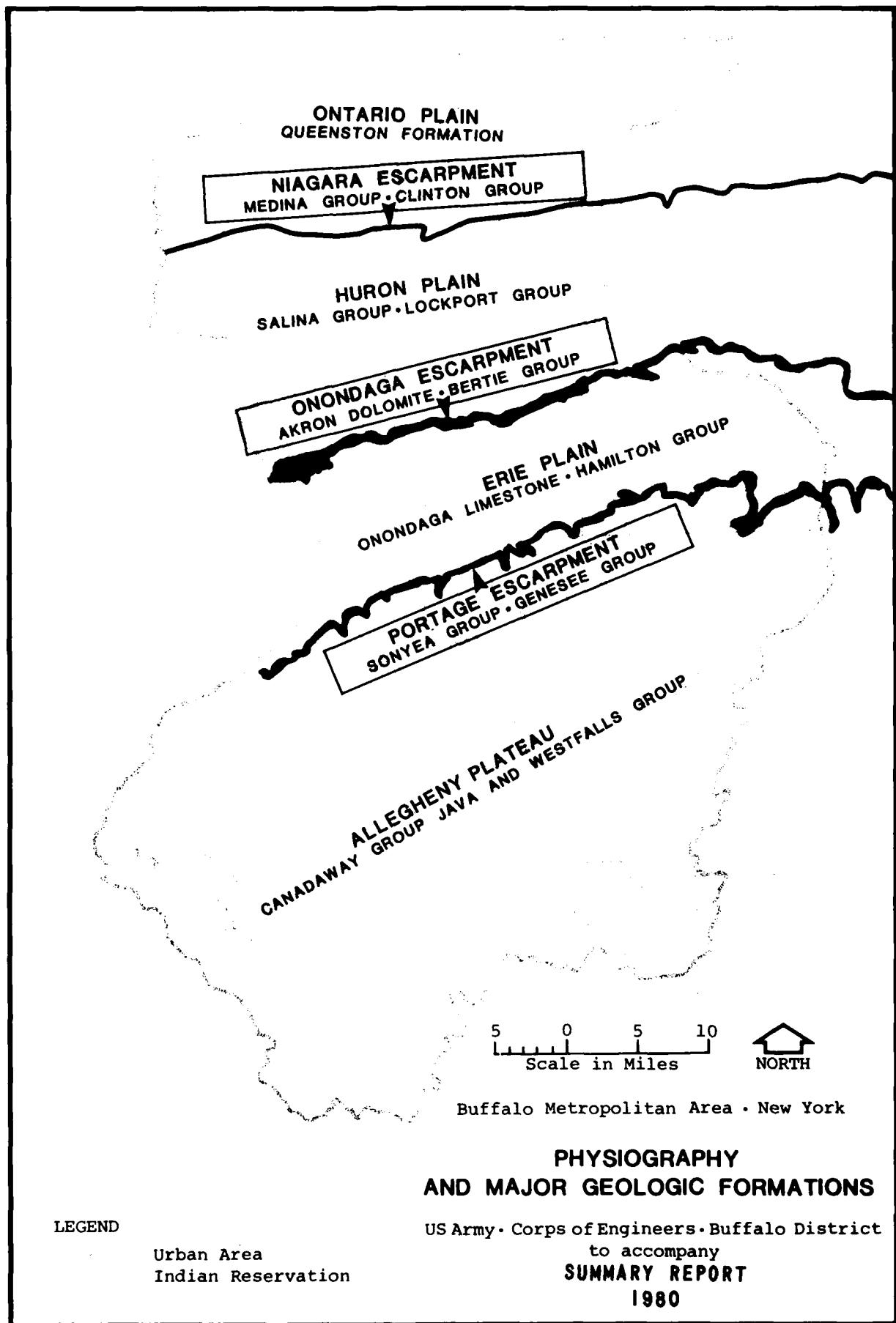
LEGEND

- Full Urbanization
- - - Partial Urbanization
- Urban Area
- Indian Reservation

**PROJECTED 2020  
URBAN DEVELOPMENT**

US Army - Corps of Engineers - Buffalo District  
to accompany

**SUMMARY REPORT  
1980**



STUDY  
PRINCIPAL

TRIBUTARIES

LAKE ERIE

Cataraqui

Eigars

Susquehanna

Smoky

Buffalo

Cambria

Elk

Congestus

NIAGARA RIVER

Scammon

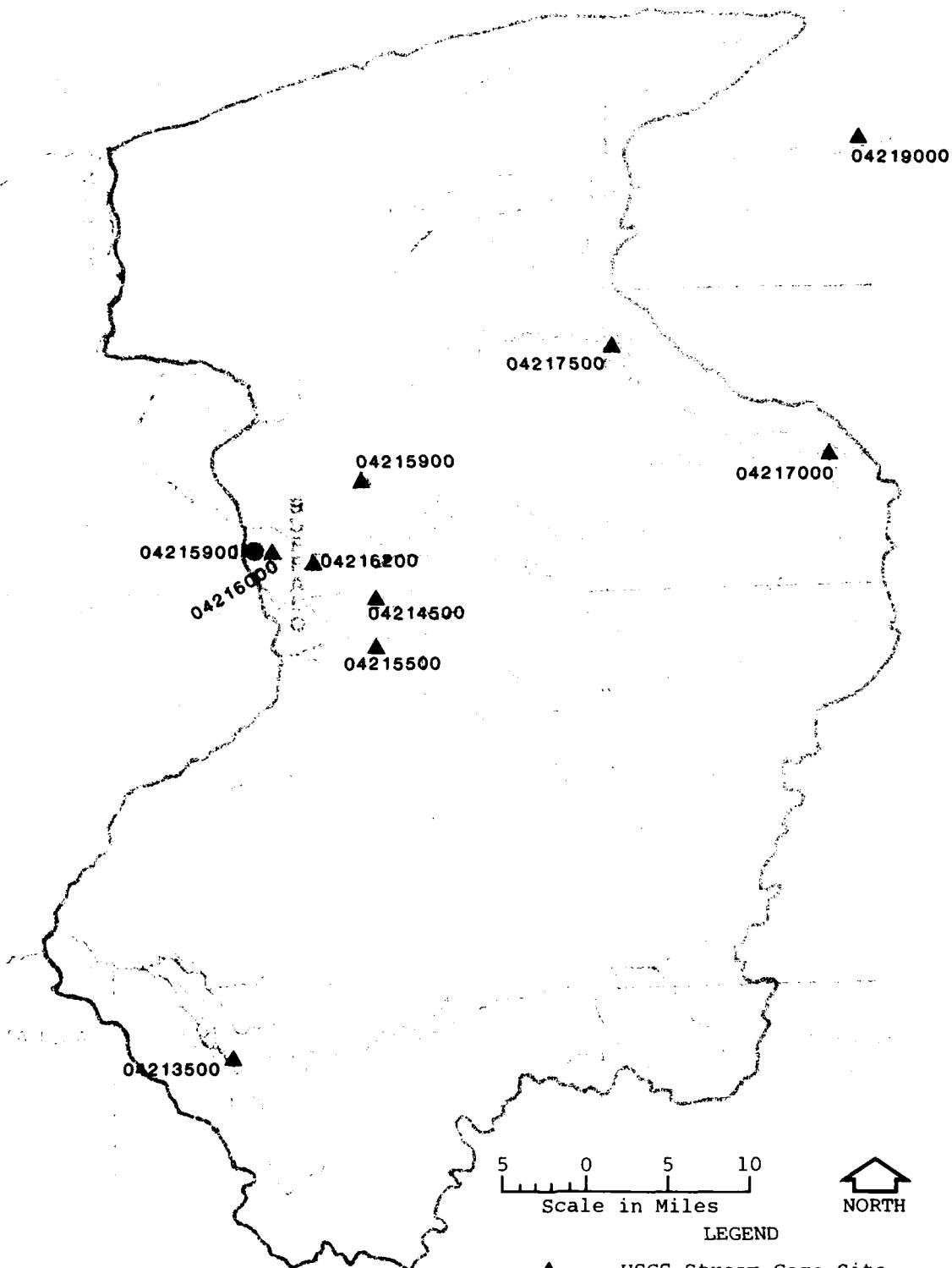
Tonawanda

Erie

LAKE ONTARIO

Eigars

Johnston



5 0 5 10  
Scale in Miles



LEGEND

- ▲ USGS Stream Gage Site
- USGS Stage Record Site
- 04213500 USGS Gage Identification Number
- Urban Area
- Indian Reservation

**CHARACTERISTICS AND RUNOFF OF PRINCIPAL STREAMS**

**STUDY AREA  
PRINCIPAL STREAMS**

**TRIBUTARY TO:**

**LAKE ERIE:**

Cattaraugus Creek  
Eighteenmile Creek  
South Branch  
Smoke Creek  
Buffalo River  
Cayuga Creek  
Buffalo Creek  
Cazenovia Creek  
West Branch  
East Branch

**NIAGARA RIVER:**

Scajaquada Creek  
Tonawanda Creek  
Ellicott Creek

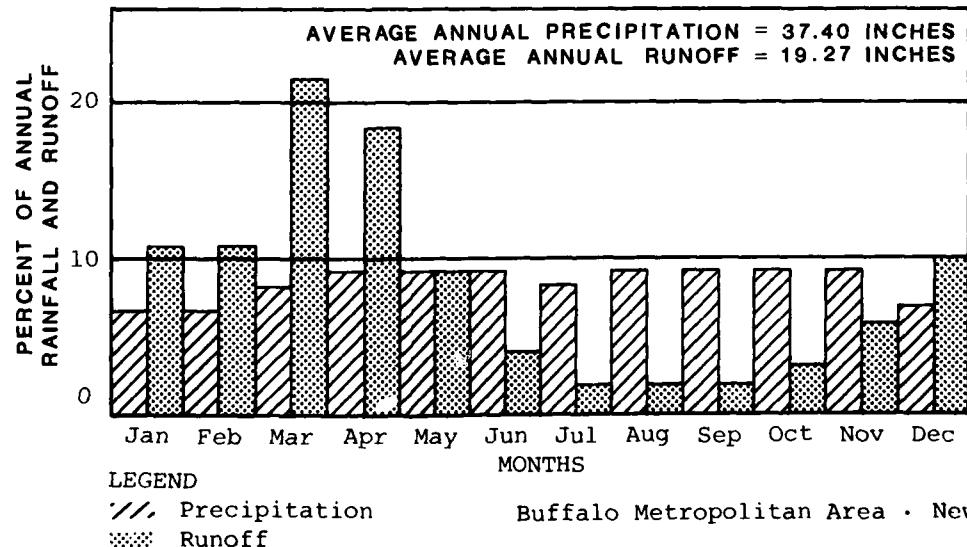
**LAKE ONTARIO:**

Eighteenmile Creek  
Johnson Creek

Length in Miles	Elevation		Drainage Area Sq.Mi.	Slope ft/mi.	Average 1/ Runoff		Drainage Area Above Gage Sq.Mi.
	Source Feet	Mouth Feet			cfsm	in.	
	Feet	Feet					
68.9	1,900	573	554.00	19.26	1.86	25.30	432.0
27.0	1,390	573	64.20	29.89			
14.2	1,290	650		45.07			
14.5	1,000	573	8.55	39.10			
8.1	590	573	436.00	2.10	1.67	22.61	144.0
39.0	1,640	590	126.00	26.92			
43.1	1,710	590	149.00	25.99			
17.5	810	575	138.00	13.43	2.07	28.17	134.0
17.6	1,430	810	59.10	35.23			
24.1	1,820	810	56.00	41.90			
35.1	570	247	-	9.20			
15.0	720	570	24.40	10.00			
101.0	1,815	570	631.00	12.33	1.46	19.87	231.0
40.0	850	570	110.00	7.00	1.69	22.99	77.6
14.8	510	245	64.00	17.90			
31.3	619	247	109.70	11.88			

1/ Average Runoff at Gage. Source: Water Resources Data for New York, Part 1. Surface Water Records, U.S. Geological Survey

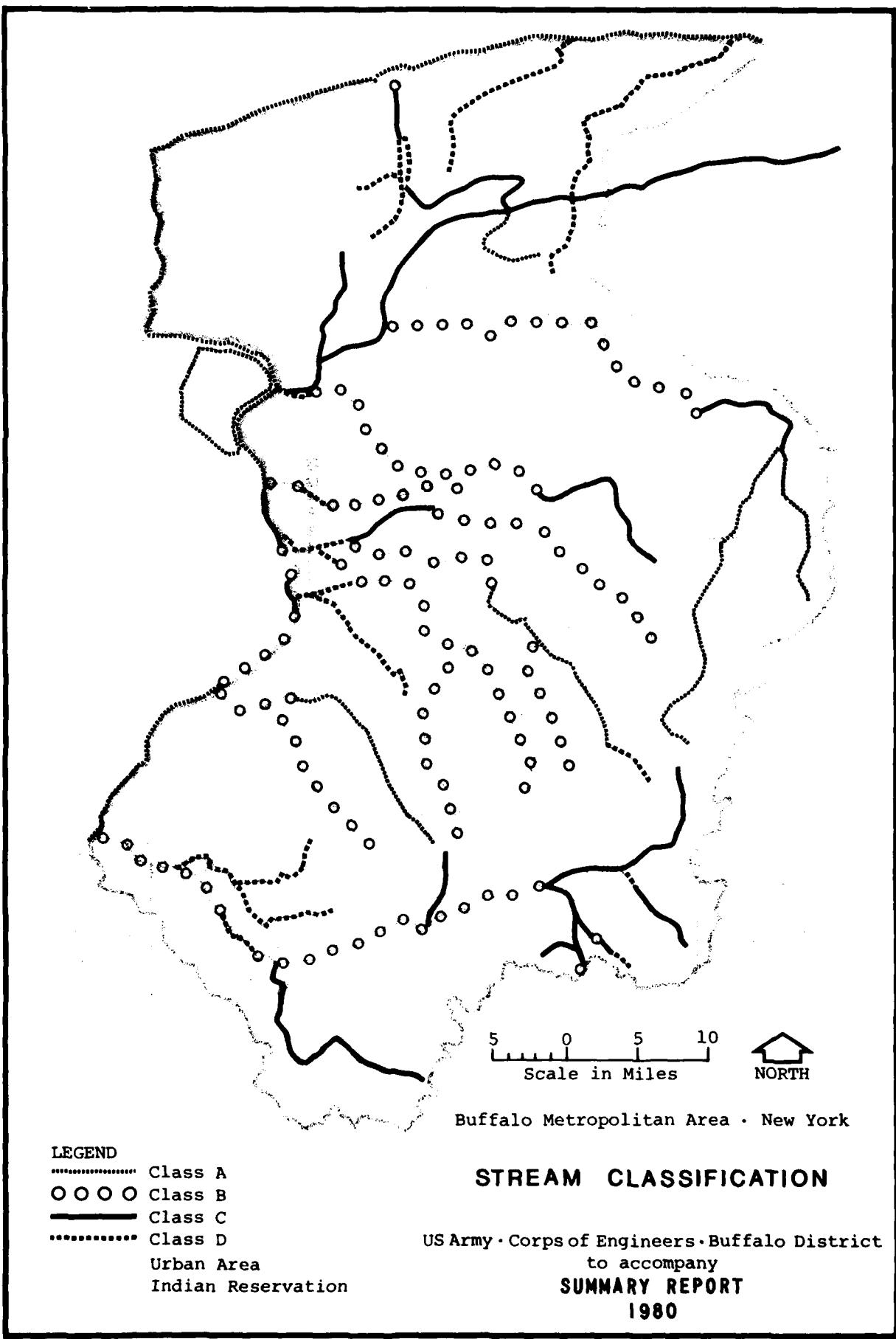
**TOTAL PRECIPITATION AND RUNOFF FROM STUDY AREA**

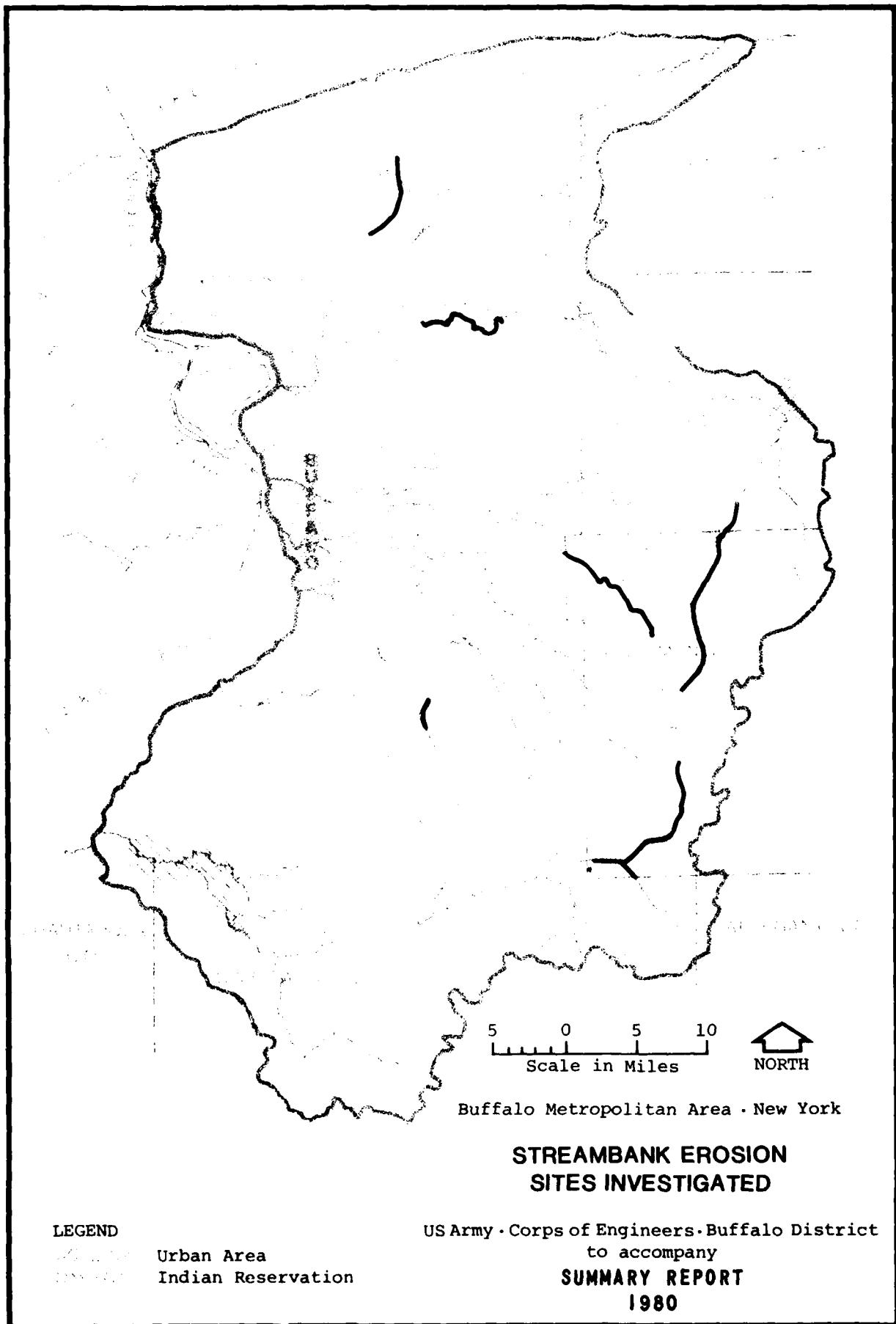


**RAINFALL AND RUNOFF**

US Army - Corps of Engineers - Buffalo District  
to accompany

**SUMMARY REPORT  
1980**





## REGIONAL STOCKING PROGRAM

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

### 1979 GREAT LAKES STOCKING - REGION 9 RECOMMENDATIONS

	<u>Location</u>	<u>Species and Number</u>
Lake Erie		
Cattaraugus Creek	Brown Trout, yearlings	25,000
	Rainbow Trout, yearlings	25,000
	Chinook, fingerlings	500,000
	Coho, yearlings	100,000
Eighteenmile Creek and South Branch	Coho, yearlings	50,000
	Steel Head yearlings	25,000
Chautauqua Creek	Coho, yearlings	50,000
	Steel Head yearlings	25,000
Barcelona Area	Lake Trout, yearlings	200,000
Total		<u>1,000,000</u>
Lake Ontario		
Olcott-Wilson Area	Rainbow Trout, yearlings	10,000
	Brown Trout, yearlings	50,000
East Branch Twelve Mile Creek	Steel Head, yearlings	13,300
Four Mile Creek	" "	13,300
Keg Creek	" "	10,000
Niagara Bar	Lake Trout, yearlings	87,500
	Lake Trout, fingerlings	<u>87,500</u>
Total		<u>271,600</u>

### 1979 URBAN POND STOCKING OF CALICO BASS RECOMMENDATIONS

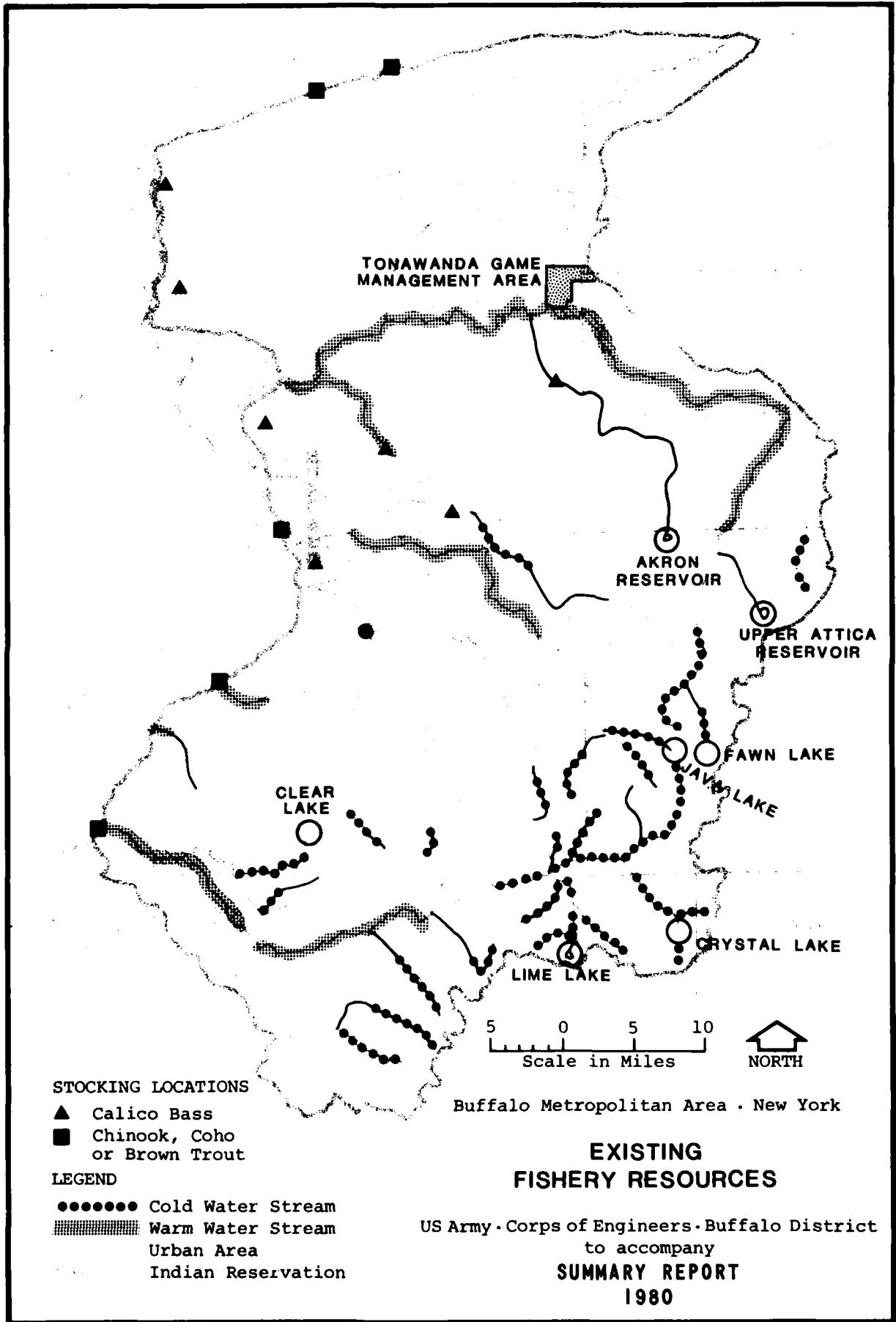
	<u>Location</u>	<u>Number Stocked</u>
Niagara County		
Hyde Park lake		2,000
Joe Davis State Park Pond		1,000
Erie County		
Sheridan Park Lake		1,700
South Park Lake		2,000
Williamsville Pond		1,800
Como Park Lake		2,000
Akron Falls Park Pond		900
Walton Pond		600

## LIST OF TROUT WATERS

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Section	Stream		
		Mileage	Status
<b>ERIE COUNTY</b>			
Buffalo Creek Watershed			
Buffalo Creek	Tributary 64 (above Wyoming County line) to Tributary 69	2.5	NSA 1/ Stocked (13) 2/
East Branch Cazenovia Creek	Blakeley Corners Road (Aurora) to Savage Road (Holland)	13.0	NSA
East Branch Cazenovia Creek	Blakeley 22 (Holland) to Source	6.0	Posted
Little Buffalo Creek	Tributary 4 (just above Clinton Street) to 0.2 miles above Tributary 10 at Marilla	3.5	NSA
Buffalo Creek, Tributary 69	Entire Stream	2.0	NSA
Eighteenmile Creek Watershed			
Eighteenmile Creek	Tributary 60 to Source	2.0	NSA
South Branch Eighteenmile Creek	New Oregon to Source	4.3	NSA
Delaware Creek	Mouth to Route 20		L. Erie Salmonid Runs
Cattaraugus Creek Watershed			
Cattaraugus Creek	Tributary 41 (just above Hecht Bridge) to Wyoming County line, above Yorkshire	7.9	Stocked (7.0) 2/
Clear Creek	Mouth to Bagdad	10.8	NSA, Rainbow Runs
North Branch Clear Creek	Mouth to Tributary 6	4.5	NSA, Rainbow Runs
Clear Creek, Tributary 9	Lower one mile	1.0	NSA, Rainbow Runs
Sudmeyer Creek	Entire Stream	2.2	Posted
Coon Brook	Month to Route 39	4.1	NSA
Kelly Brook	Entire Stream	1.0	Posted
Derby Brook-plus Tributaries 2, 3 & 4	Entire Stream	4.8	NSA
Spooner Brook	Mouth to Trevett Rd (0.1 mi. above Tributary 6)	5.6	NSA
Spring Brook	Pond 115 at Springville to Source	3.5	NSA
Tributary 34A	Entire Stream		
Hosmer Brook	Entire stream	4.0	Stocked (2.0) 2/
Cattaraugus Creek, Tributary 51	Mouth to Wyoming County line	2.5	NSA
<b>WYOMING COUNTY</b>			
Niagara River Watershed			
Tonawanda Creek	Tributary 66 at Varysburg to 0.5 miles above Southburg	9.0	NSA, Stocked (6.0) 2/
Little Tonawanda Creek	Tributary 8 to Dale	3.2	Stocked (3.2) 2/
Little Tonawanda Creek, Tributary 8	Lower 0.25 mile	0.25	NSA
East Fork Tonawanda Creek	One mile below Tributary 3 to Tributary 4	1.5	NSA
Perry Brook	Lower one mile	1.0	NSA
Buffalo Creek Watershed			
Buffalo Creek	Factory Road (Sheldon) upstream to Erie county Line	4.0	Stocked (4.0)
Beaver Meadow Creek	Mouth to Tributary 2	4.5	Stocked (4.5) 2/
Fitzgerald Brook	0.5 miles below Tributary 2 to Tributary 3	1.5	NSA
Fitzgerald Brook, Tributary 2	Mouth to Tributary 1	0.4	NSA
Fitzgerald Brook, Tributary 1 of 2	Entire stream	0.6	NSA
Cattaraugus Creek Watershed			
Cattaraugus Creek	County line (just above Yorkshire) to Java Lake	11.5	Stocked (11.2) 2/
Cattaraugus Creek, Tributary 51	Erie County line to Source	1.8	NSA
Clear Creek	Mouth at Arcade to Cattaraugus county line	1.6	NSA, Stocked
Monkey Run	Tributary 3 to Source	2.0	NSA
Hiram Lake Outlet	Entire stream	1.7	NSA
Flynn Brook	Mouth to Tributary 4	2.5	NSA
Flynn Brook, Tributary 2	Entire stream	1.5	NSA
Witherill Brook	Mouth to Tributary 2	1.0	NSA
Witherill Brook, Tributary 1 of 2	Entire stream	0.8	NSA
	Entire stream	0.3	NSA

1/ NSA - Natural Spawning Adequate  
 2/ Number in Parenthesis represents the number of miles stocked  
 2/ This listing does not include salmon stocking in Eighteenmile and Cattaraugus Creeks.

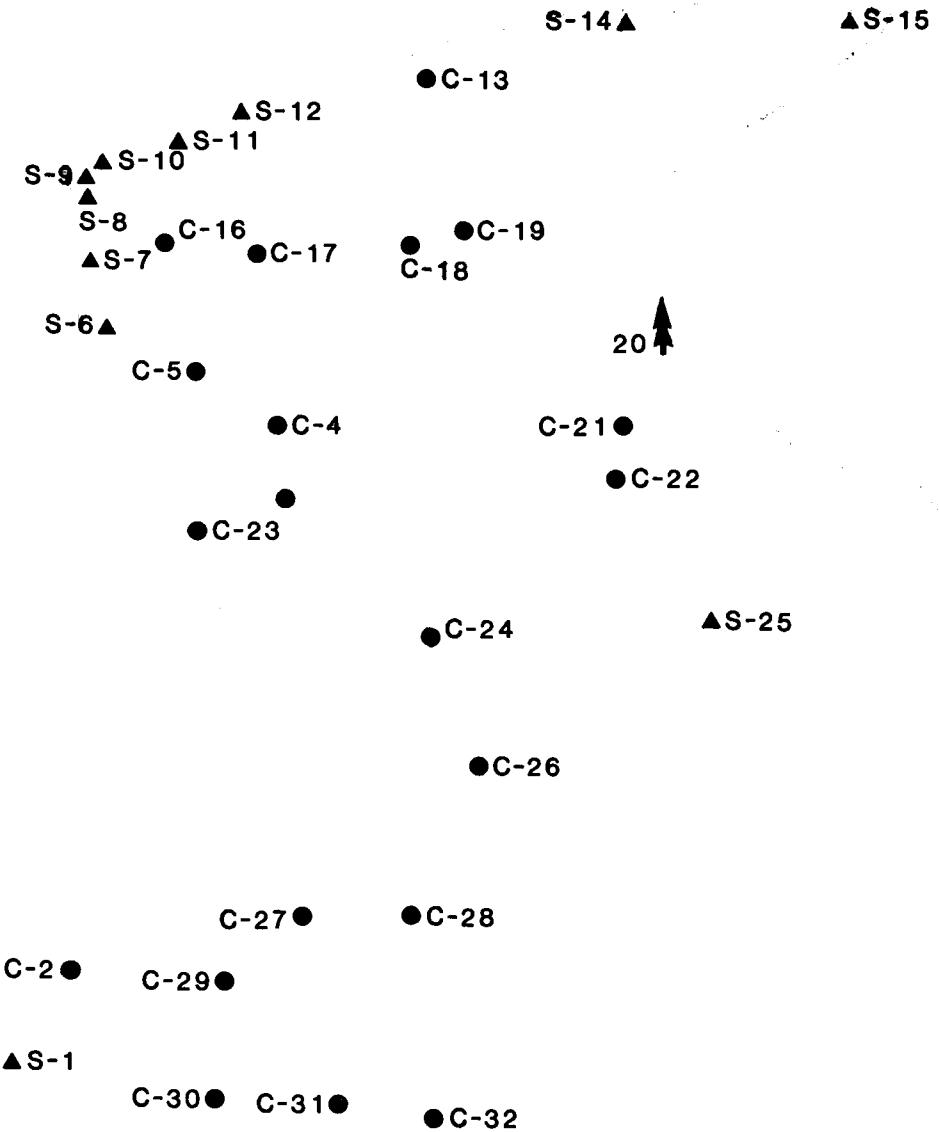


## STREAM RIGHTS ACQUISITION PROGRAM

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

<u>Location</u>	<u>Additional Miles Recommended For Purchase</u>	<u>Miles Purchased to Date *Dec. 1978</u>
<b>ERIE COUNTY</b>		
Eighteenmile Creek	6.0 (Mouth up 6 miles)	None
Cattaraugus Creek	4.86 (Tributary 41 to Wyoming County line)	1.84
Hosmer Brook	0.06 (Entire Stream)	1.48
Spring Brook	3.5 (Pond 115 at Springville to Source)	None
<b>WYOMING COUNTY</b>		
Cattaraugus Creek	4.50 (Wyoming County line to Java Lake)	7.25
Flynn Brook	None	0.78
Clear Creek	None	0.59
<b>CATTARAUGUS COUNTY</b>		
Cattaraugus Creek	5.67 (Tributary 41 to Wyoming County line)	1.88
Lime Lake Outlet	0.763 (Entire Stream)	3.74
McKinstry Creek	1.88 (Entire Stream)	2.76
Clear Creek	0.67 (Entire Stream)	3.91
Elton Creek	10.96 (Mouth to Tributary 16)	4.19
Mansfield Creek	0.90 (Mouth to Maples)	3.77
South Branch Cattaraugus Creek	4.0 (First bridge upstream 4 miles)	1.61
<b>CHAUTAUQUA COUNTY</b>		
Cattaraugus Creek	2.0 (Lower 2 miles)	None

\*Mileages are the total the  
Albany Office provided



5      0      5      10  
Scale in Miles



LEGEND

● C-19 County Site  
▲ S-25 State Site

Urban Area  
Indian Reservation

Resource Based Recreation Area  
(Tonawanda Game Management Area)

		CAMPING	SWIMMING	FISHING	PICNICKING	BOATING	HUNTING					
		▲ U	▲ N	▲ D	▲ E	▲ V	▲ E	▲ L	● O	○ P	● E	○ D
EVANGOLA	S-1	▲										
STURGEON POINT	C-2		▲	D	E	V	E	L	●	O	P	E
ELLICOTT CREEK	C-3								●			
CANAL WEST	C-4								●			
OPPENHEIM	C-5								●			
WHIRLPOOL	S-6							▲				
RESERVOIR	S-7							▲				
LEWISTON	S-8							▲				
LOWER NIAGARA	S-9	U	N	D	E	V	E	L	O	P	E	D
FORT NIAGARA	S-10				▲	▲	▲	▲	▲			
4 MILE CREEK	S-11			▲	▲	▲	▲	▲	●			
WILSON TUSCARORA	S-12	U	N	D	E	V	E	L	O	P	E	D
KRULL - OLcott	C-13				●	●	●	●				
GOLDEN HILL	S-14								●			
LAKE SIDE BEACH	S-15	U	N	D	E	V	E	L	O	P	E	D
BOND LAKE	C-16								○	○	○	
LOCKPORT	C-17								○	○	○	
ROYALTON	C-18	U	N	D	E	V	E	L	O	P	E	D
NIAGARA COUNTY GOLF CLUB	C-19								●			
TONAWANDA GMA	20								▲			
BEEMAN CREEK	C-21	U	N	D	E	V	E	L	O	P	E	D
AKRON FALLS	C-22								●			
ISLE VIEW	C-23								●		●	
COMO LAKE	C-24								●			
DARIEN LAKES	S-25	▲		▲		●		▲		▲		
ELMA MEADOWS	C-26								●			
CHESTNUT RIDGE	C-27								●			
EMERY	C-28								●			
EIGHTEEN MILE CREEK	C-29	U	N	D	E	V	E	L	O	P	E	D
LARKIN	C-30								○	○	○	
BOSTON	C-31	U	N	D	E	V	E	L	O	P	E	D
SPRAGUE	C-32								●	●		

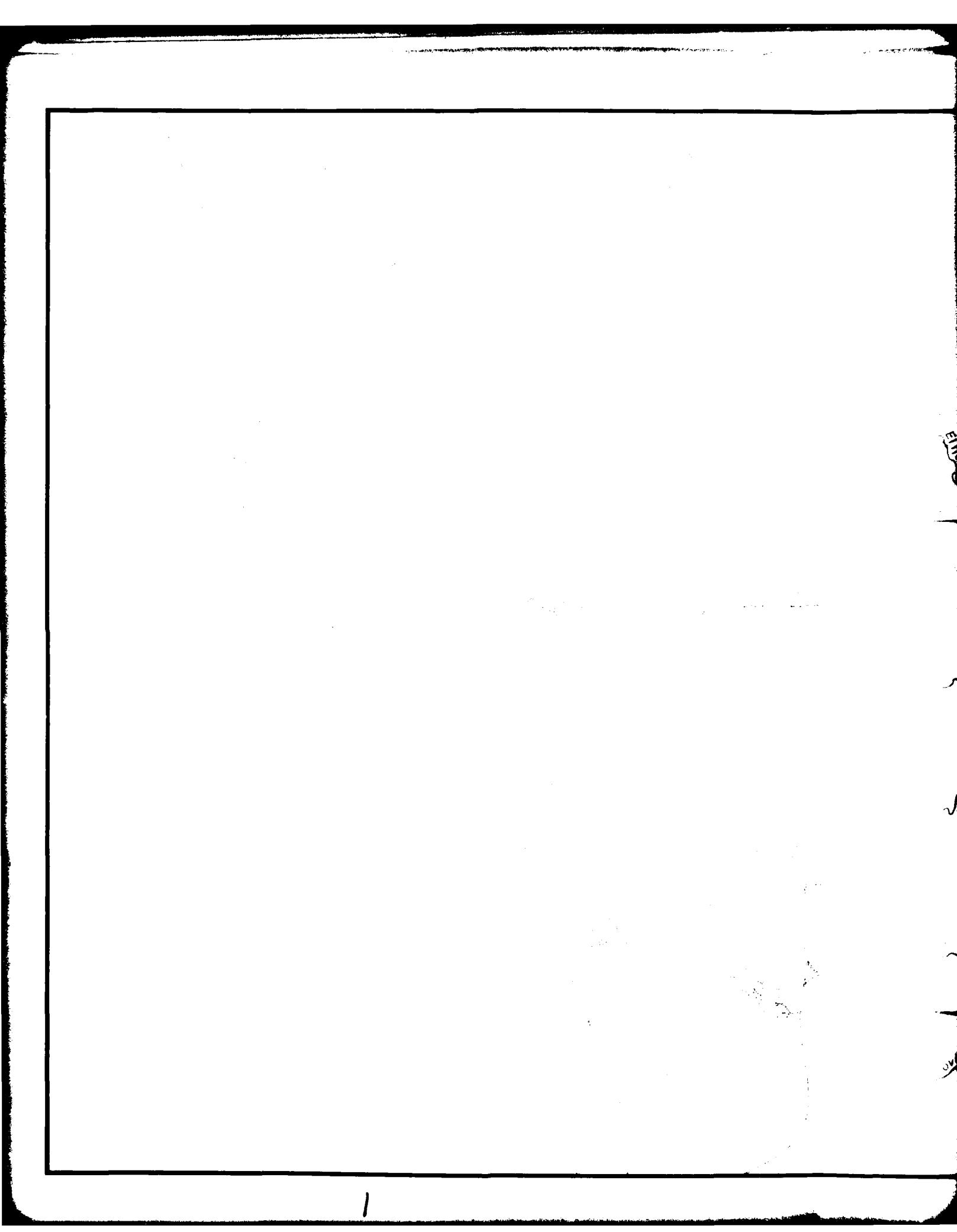
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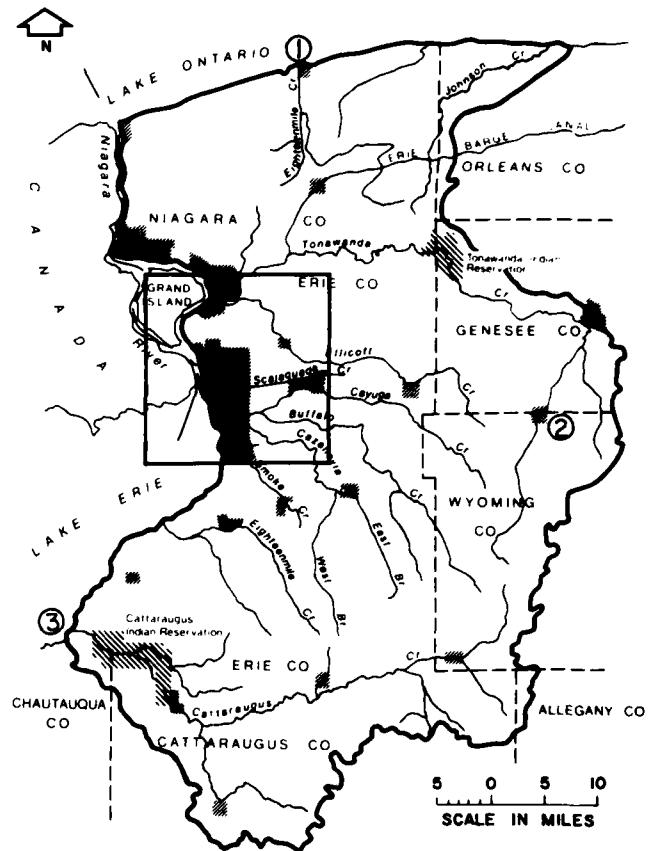
### PUBLIC RECREATION SITES

US Army • Corps of Engineers • Buffalo District  
to accompany

**SUMMARY REPORT**  
**1980**

Urban Area  
Indian Reservation  
ion Area  
ent Area)





LEGEND

- ① MODIFICATION TO EXISTING NAVIGATION PROJECT RECOMMENDED
- ② FLOOD MANAGEMENT PROJECT RECOMMENDED
- ③ NAVIGATION AND FLOOD MANAGEMENT PROJECT AUTHORIZED BUT NOT CONSTRUCTED

VICINITY MAP FOR WATERFRONT AREA  
AND LOCATION MAP OF AUTHORIZED AND  
RECOMMENDED CORPS PROJECTS NOT  
CONSTRUCTED

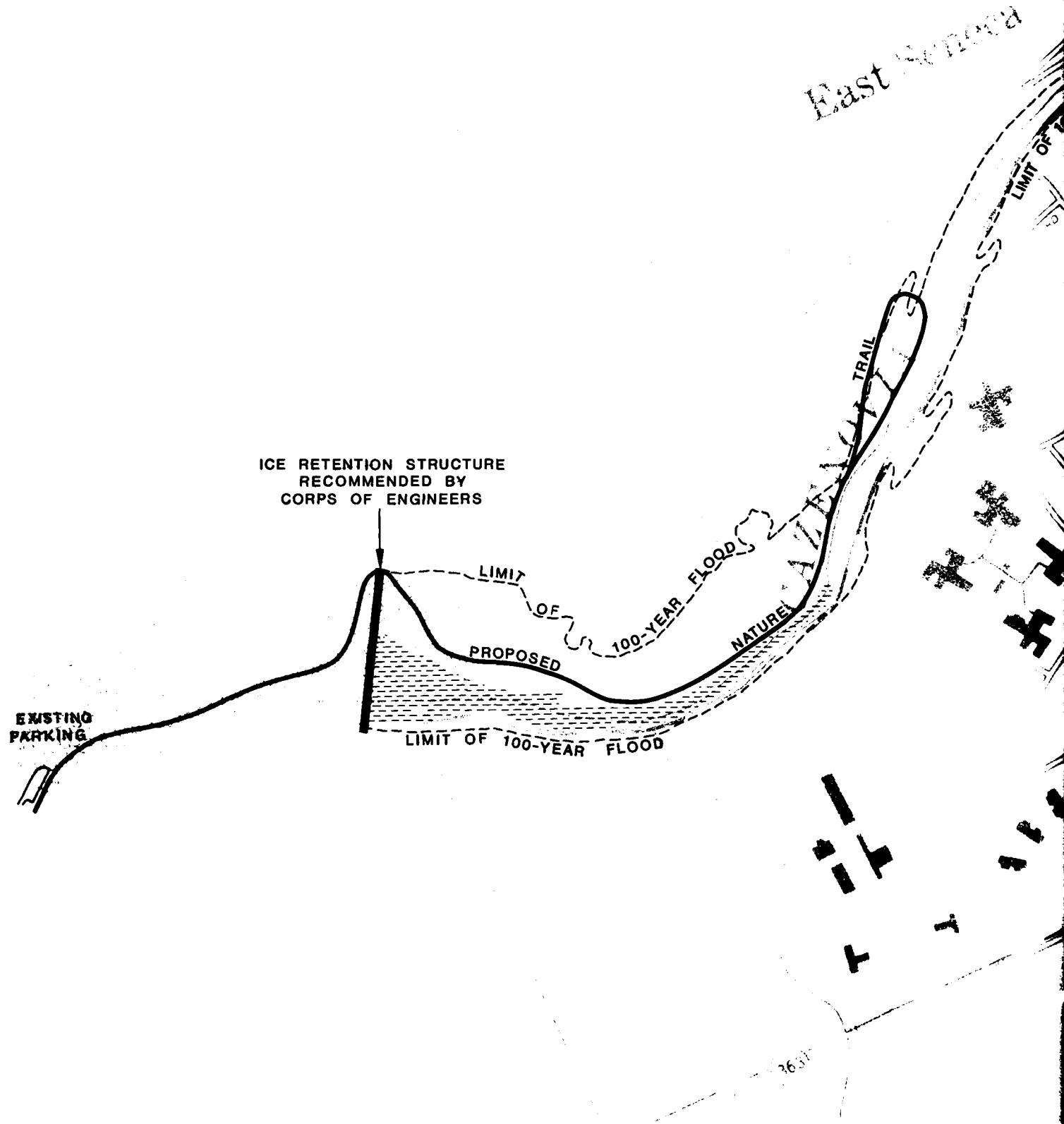


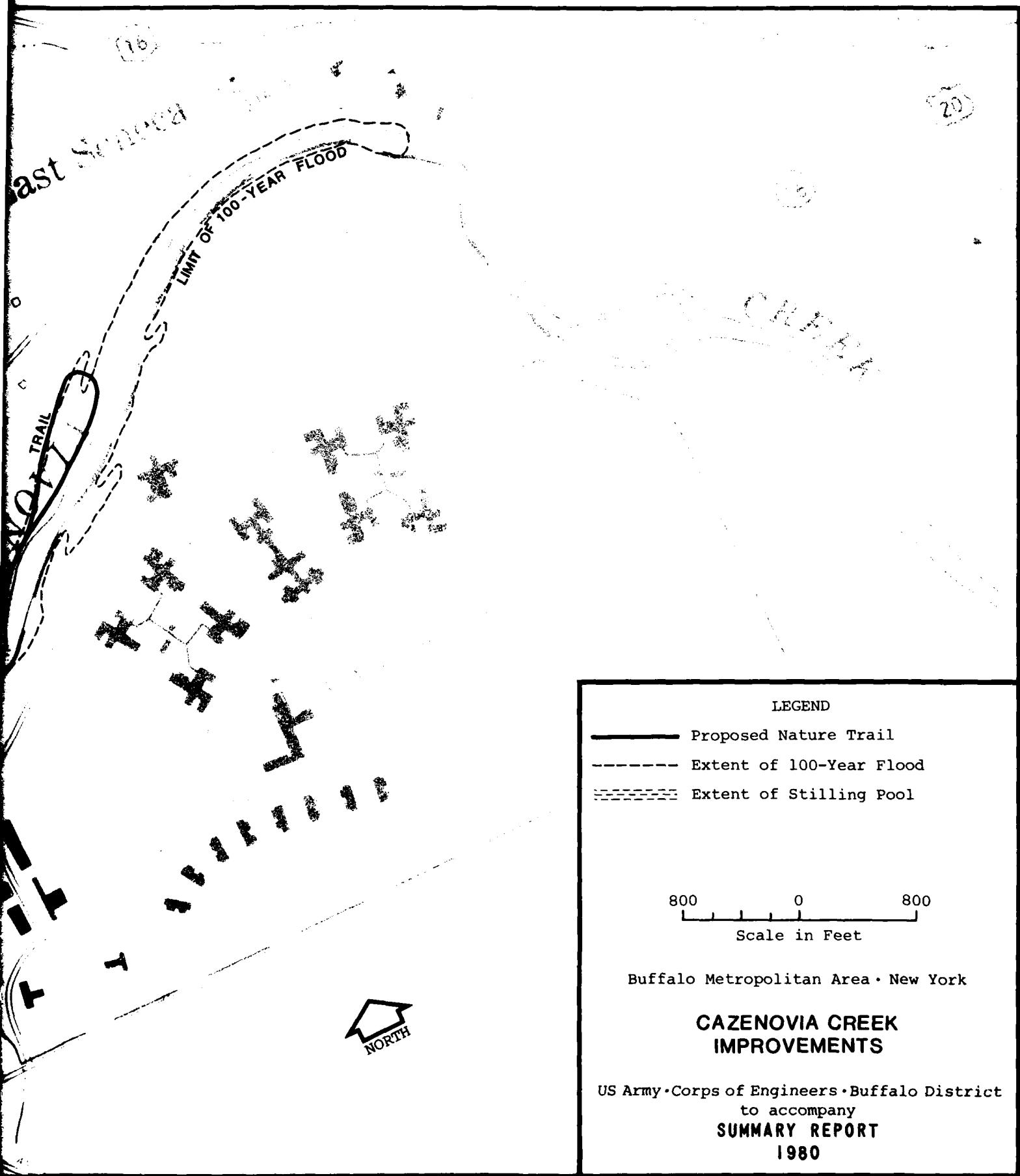
1 0 1  
Scale in Miles

Buffalo Metropolitan Area • New York

**REGIONAL IMPROVEMENTS  
LOCATION MAP**

US Army • Corps of Engineers • Buffalo District  
to accompany  
**SUMMARY REPORT  
1980**



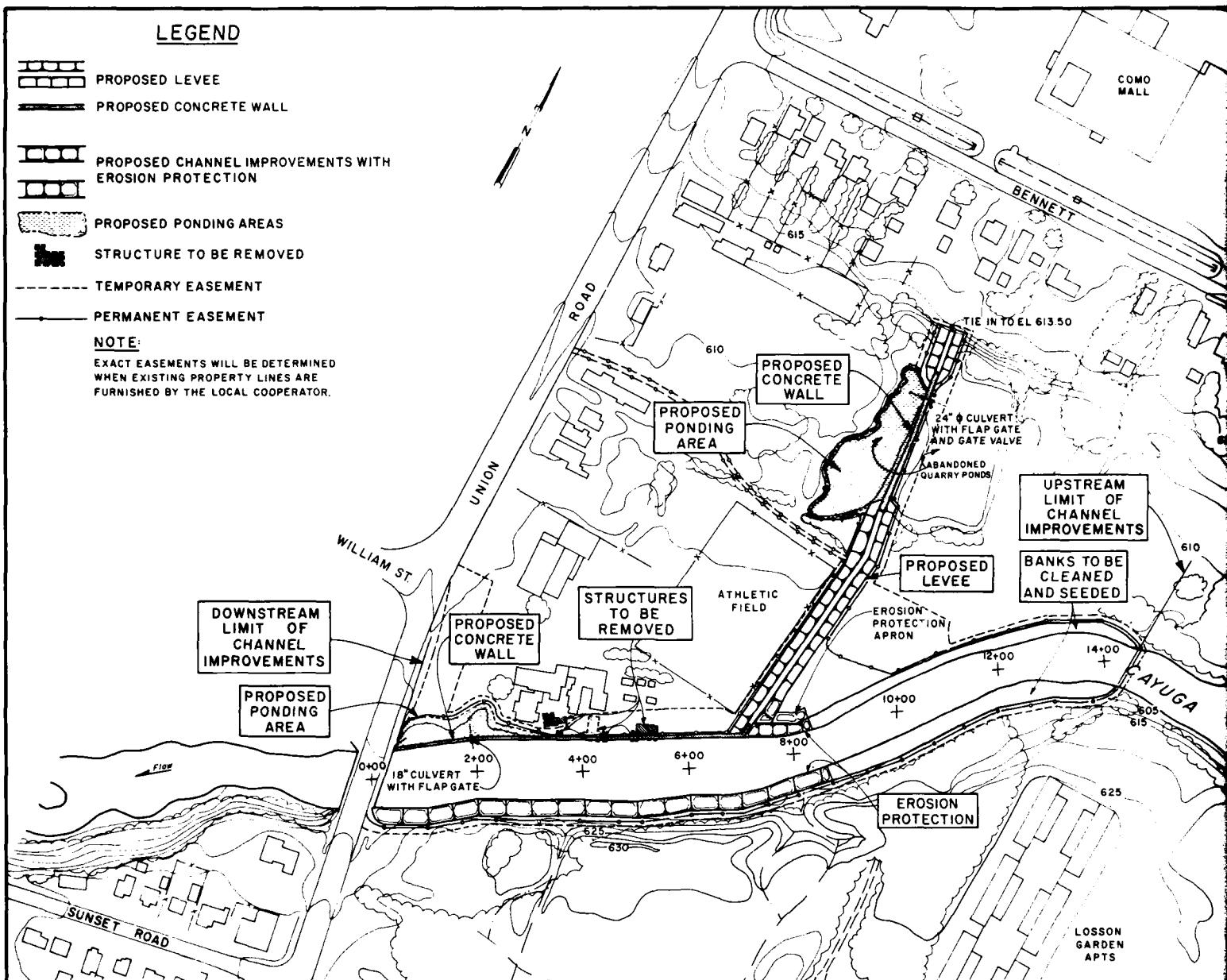


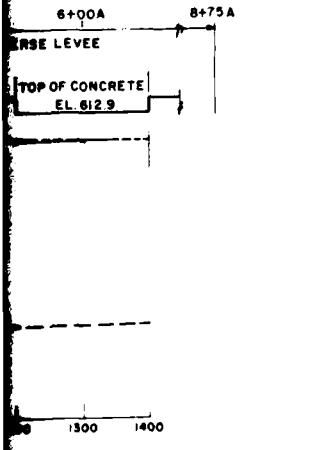
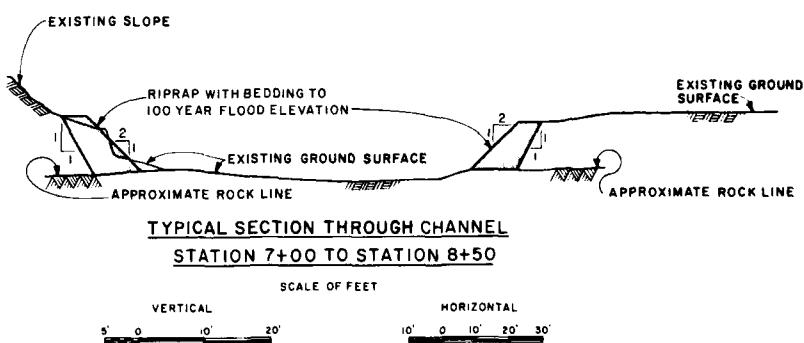
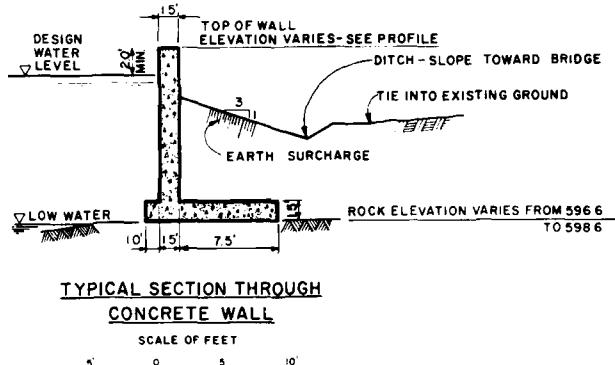
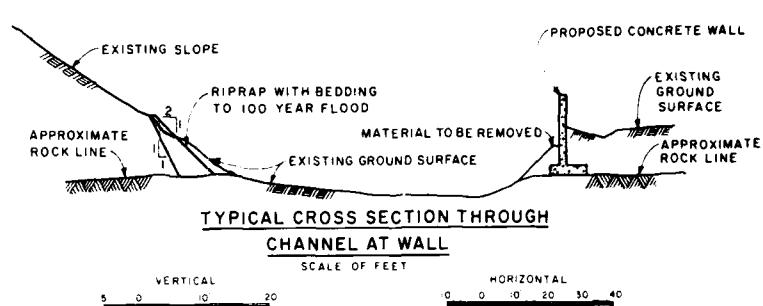
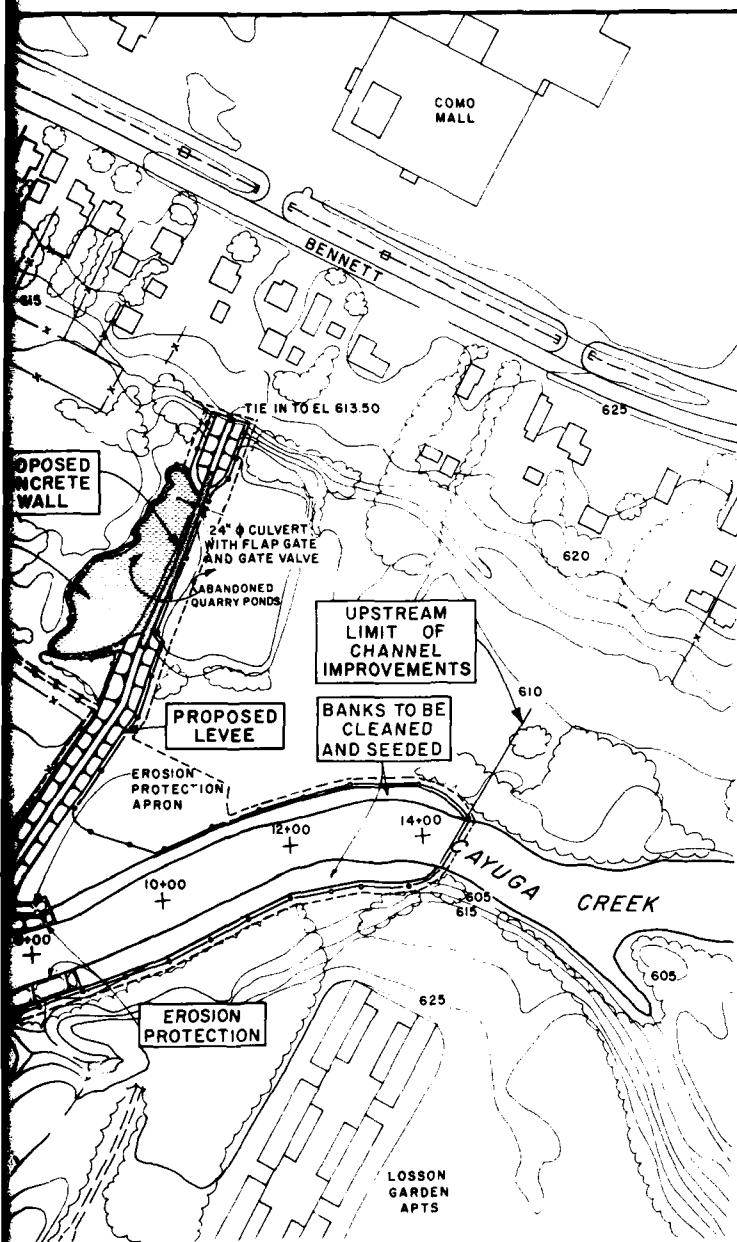
## LEGEND

- PROPOSED LEVEE
- PROPOSED CONCRETE WALL
- PROPOSED CHANNEL IMPROVEMENTS WITH EROSION PROTECTION
- PROPOSED PONDING AREAS
- STRUCTURE TO BE REMOVED
- TEMPORARY EASEMENT
- PERMANENT EASEMENT

### NOTE:

EXACT EASEMENTS WILL BE DETERMINED WHEN EXISTING PROPERTY LINES ARE FURNISHED BY THE LOCAL COOPERATOR.



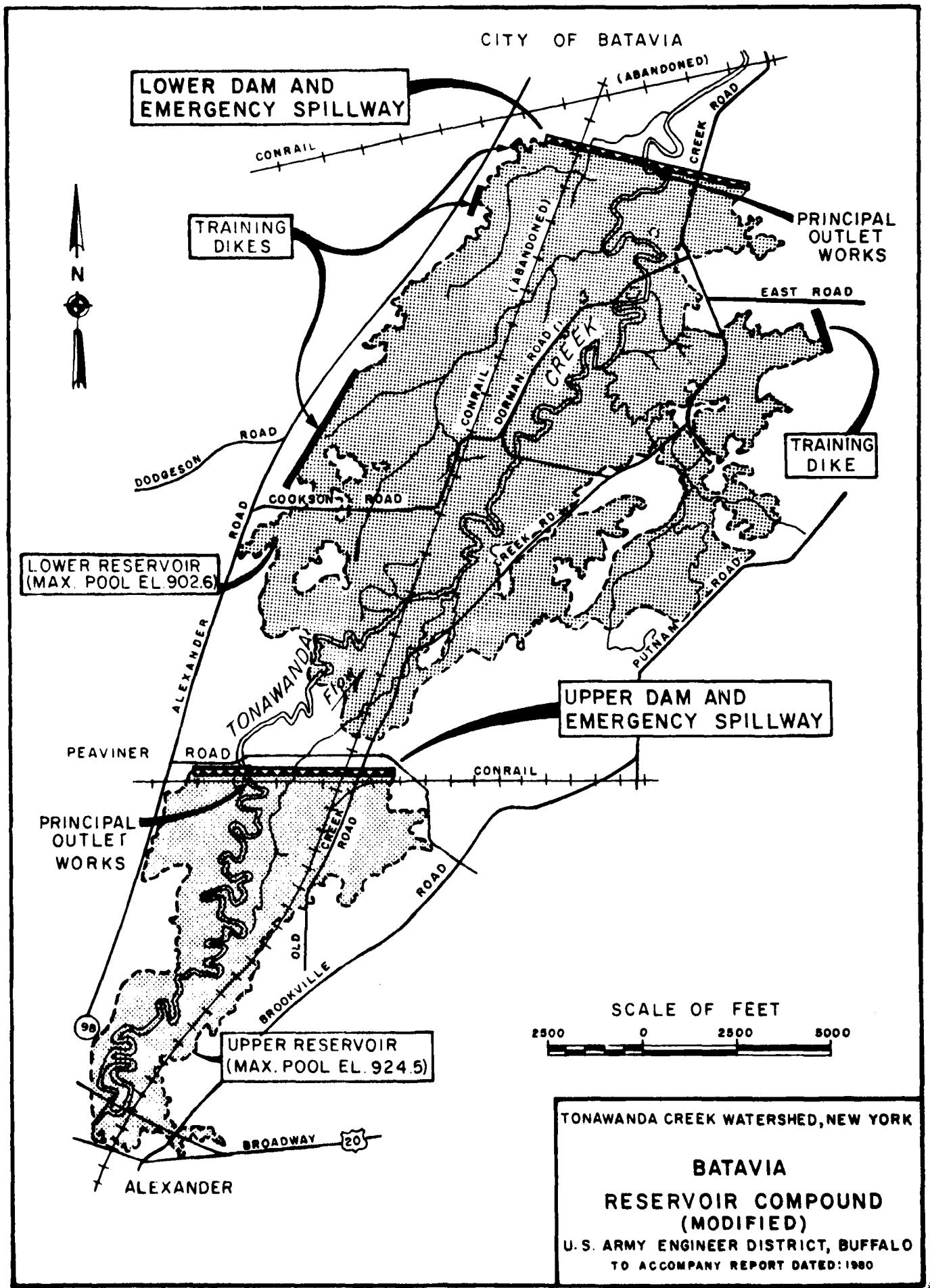


CAYUGA CREEK, CHEKTOWAGA, NEW YORK  
LOCAL FLOOD PROTECTION

**SELECTED PLAN**  
**SECTION 205**  
**DETAILED PROJECT REPORT**

U. S. ARMY ENGINEER DISTRICT  
JUNE 1979

BUFFALO



**DAI**  
**FILM**